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SANITATION,
BRIDGES.

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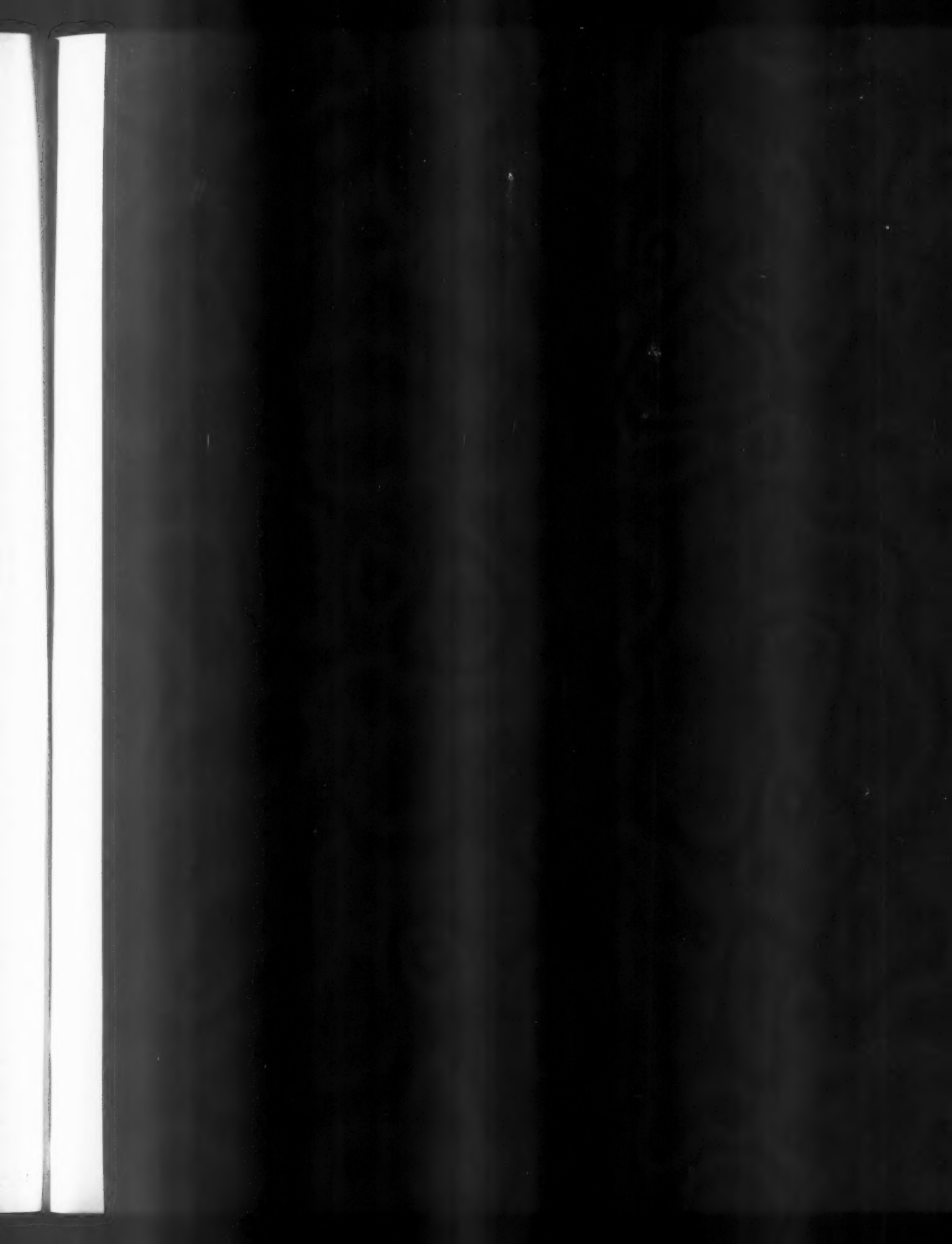

Municipal Engineering

VOLUME XI. OCTOBER, EIGHTEEN NINETY-SIX. NUMBER 4.

GRANITE PAVING IN BERLIN.

By Robert Grimshaw, Ph. D., C. E.

The following instructions for granite paving in the city of Berlin, Germany, are prepared by the city inspector, Mr. Siebeneicher.

Most of the stones come in cubes from 18 to 20 centimeters =7.2 to 8 inches* on a side, fairly regular, but about 1 in 15 or 20 that are used are one-half longer, but with

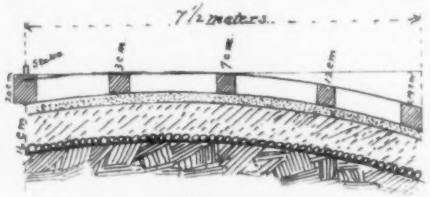

Fig. 1.

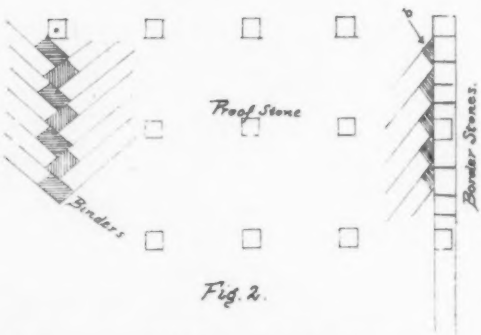

Fig. 2.

the same width and height as the rest. These are binders. The greatest care is taken in shipping and handling all the stones, to preserve their edges and corners.

The operation of paving is divided into two principal parts:

I. Making the bed or foundation layer.

II. Laying the pavement proper.

I. The under layer may be (1) of stone or (2) of concrete.

(1) *Stone foundation layer.* The conditions for a good pavement demand that the stones be not rammed into the foundation, but that the latter have exactly the same profile as the desired upper layer is to have.

The foundation or bed is made 22 cm. = 8.8 inches thick, so that the street must be stripped or filled, as the case may be, to 42 cm. = 16.8 inches from the desired upper profile of the granite surface.

As regards the cross section, for streets of ordinary width, a fall of 1 in 40 is usually adopted. The depth at the curb is such that the footway shall lie only 10 to 12 cm. (= 4 to 4.8 inches) above the roadway.

The foundation layer consists of

(*a*) A bed 10 cm.,=4 inches, thick of cobbles.

(*b*) A filling 8 cm.,=3.2 inches, of stone spalls.

(*c*) A covering 8 cm.,= 3.2 inches, of coarse gravel.

The under layer is laid, rammed or rolled as nearly as possible to the desired profile. The stones are laid on their broad sides and close together, the spaces filled with broken stone, 2 to 3 cm.,= 0.8 to

*The centimeter, although really about 0.394 inch, is assumed as 0.4 inch.

1.2 inches, in diameter, and all well rolled, and spalls then added and rolled up to the required thickness. The gravel is intended to form a solid but elastic cushion between the paving and the bed, and it must be sharp and free from earth, properly only clean quartz, free from disintegratable stuff, coarse and with but little fine sand, also free from large stones. But small stones of say 10–20 cm.,=4 to 8 inches increase its value. The gravel is well raked into the layer of stone spalls and its own profile raked into shape, and any stones that may

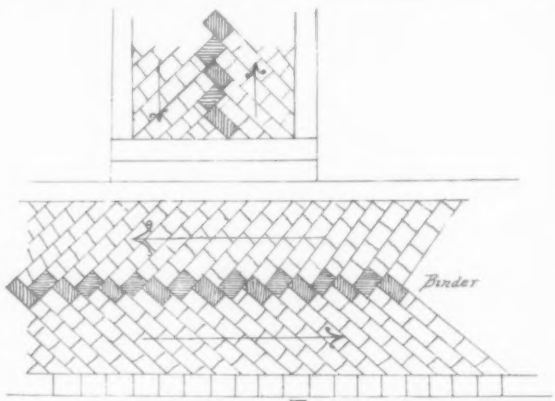

Fig 3.

come to the top are raked off and used elsewhere.

(2) *Concrete foundation* consists of

(*a*) 20 cm.,=8 inches, of concrete.

(*b*) 2 to 3 cm.,=0.8 to 1.2 inches, of gravel.

The concrete is a mixture of cement and gravel, and it takes for each cubic meter,=1.3 cubic yards, of gravel one ton of cement, coming in barrels of 180 kilog.,= 396 lbs.,† gross or 170 kilog.,=374 lbs., net. The gravel must be coarse, sharp and free from all earthy matter, and throughout of hard sound quartz with no disintegratable material. The cement must be even in quality and good.

The concrete must be carefully made on the spot on wooden platforms; the gravel and concrete must be dry and not allowed to get mixed with other material by dumping on the ground. They are then mixed together with the aid of water. To get the right profile, strips of the concrete are brought up to proper height and outline, by strikeboards and templates, then the intermediate spaces are filled and well stamped so as to make a homogeneous mass and conform to the profile called for.

The concrete must be allowed to harden from 6 to 8 days according to weather and temperature, before the gravel is spread thereon. The gravel layer should be 2 to 3 cm., =0.8 to 1.2 inch, deep, so as to make the entire bed 22 to 23 cm., =8.8 to 9.2 inches.

II. *Paving Proper.* The stones may be laid in several ways:

(*a*) With only diagonal joints in every direction, and without bond.

(*b*) With lengthwise joints, crosswise of the street, and with bond, and

(*c*) With diagonal lengthwise joints and with bond.

The first method is not recommended for streets, only for vestibules, courts, etc.

The second is usually only for grades of 1 in 25.

The third is the most durable and practical for street purposes.

The edges and corners of the stones are naturally the weakest and least durable parts, and must be preserved from the action of the wheels of heavy vehicles, and this

†All pounds here mentioned are avoirdupois. The kilogram is 2.2 lb. avoirdupois.

is best effected by the diagonal arrangement, which offers no joint at all to wheels going lengthwise of the street. It also is most favorable for horses, as it offers the greatest number of supporting points to their hoofs.

The first thing done is to lay down the center line at which the diagonal runs from both sides shall meet (see figures 1 and 2), the paver drives a stake in the center (see figure 2) and fastens thereto a stout cord. At a distance of 30 to 40 meters, = say 100 to 125 feet, he drives another center stake, to which he stretches the cord. Under the two ends of the cord he sets two stones, exactly at the right level for the center line of the street, and brings the cord to their tops, then sets a row of stones about 6 feet apart all along the center line, touching the cord.

He then proceeds to set other proof stones in parallel lines to give the required profile. For a street 15 meters, = say 50 feet wide, and a rise of 1 in 40, the entire drop will be about 19 cm., = say, 7.6 inches, distributed as shown at *a*, *a*, in figure 1, which shows four proof stones on one side of the central line, and having their tops respectively 3, 7, 12 and 19 cm., = 1.2, 2.8, 3.6 and 7.6 inches, below the center level.

Then the intermediate stones are laid in each square, care being taken to preserve the proper angle of 45° and to run the bond stones with their greatest length at right angles to the rows, as seen in figure 2.

The outer borders are laid lengthwise of the street, the butts of each row meeting them diagonally.

Each stone, whether binder, border, or ordinary, is raised with gravel to a height of 3 to 5 cm., = 1.2 to 2 inches, above the proof-stones and rammed down to the level of the latter. If it gets rammed too low it must be taken out and filled under with gravel, and then rerammed. The profile is tested in both directions in each square by a 6-foot staff resting on the proof-stones. The triangular spaces at the edges are fillers (*bb* fig. 2) cut by the paver from the cubes.

The paver must take care that all the stones in any one row are of the same width; also that the joints in adjacent rows come "staggering;" and to effect this he uses where necessary "binders" placed lengthwise at that end of the row nearest the edge.

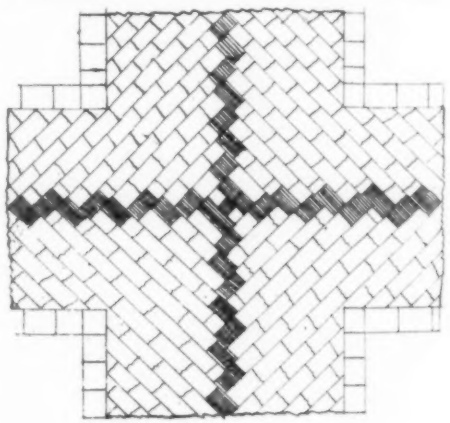

Fig 4

After the setting of the stones the joints are filled. This may be done

(1) With gravel only.

(2) With hydraulic mortar.

Gravel filling is done as follows: When a certain section of work is set, then the paver fills the joints with good screened coarse gravel, using an iron rake and a knife-like tool to work the stuff well in and down. Should any stone be found out of place so as to give too wide a joint, it must be worked into proper position and filled all around evenly.

Then the entire surface is hand-

rammed, to bring it more perfectly to profile, and to work in the gravel more thoroughly. Then the entire surface is covered with 1 cm., = 0.4 inch, of sand and given over to traffic.

It is recommended, for the solidity of the work, that it be again sanded after a rain or good watering, so as to ensure that all the joints are thoroughly filled.

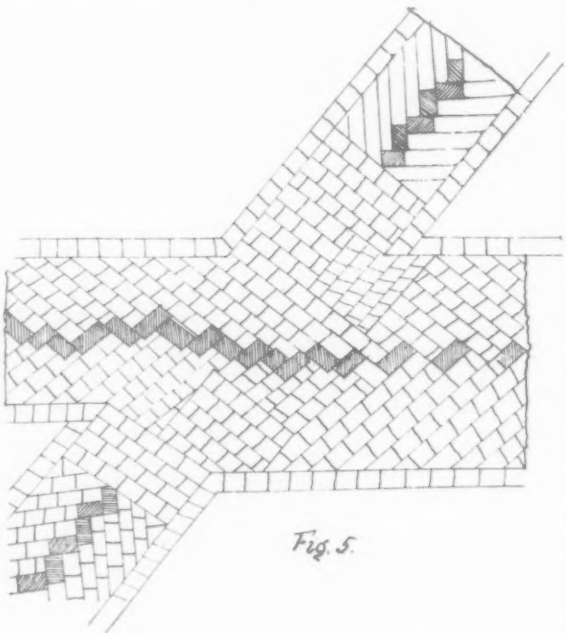

Fig. 5.

Filling the joints with hydraulic mortar is done as follows:

The paving is well watered, to thoroughly wet the under layer of gravel; and then thin, clear hydraulic lime grouting is liberally poured thereon. This flows down between the blocks and penetrates the gravel without closing the joints and makes a good bedding for the stone on the gravel. Then at once the joints are filled with semi-fluid* lime (or better yet cement) mortar made of about half lime or cement and sharp, course sand, dropped in with wooden shovels, and worked in with birch brooms; and then, before the mortar has set, the work is rammed, and stones that are out of place worked into proper position with the knife-edge tool, as before directed for gravel filling. Then, when the mortar is hard, the whole is poured over with thin cement which penetrates the fine crevices and pores in the mortar; and a layer of sharp gravel is spread over all, to be worked into the upper cracks by traffic.

Of course it is necessary that where lime mortar is used it be allowed to set some days before the street is opened for traffic. The cement or lime must be of a character to set slowly but become very hard and firm.

Joint filling with lime or cement mortar has over gravel filling many advantages, especially as regards giving the paving solidity and durability.

Where the joints are filled with gravel, each stone has to bear alone, without support from its neighbors, the entire pressure put upon it. But this pressure, whether from vehicle wheels or from horses' hoofs, comes first in a verticle and then in an oblique direction, and this tends to work the stone out of its proper position. With cement fillings each stone shares with its neighbors the shocks and thrusts which it receives; the whole paving constituting, in effect, a stone vaulting.

Also, where the joints are gravel-filled, a great part of the liquids falling on the blocks filter through into the gravel bed below, which gradually becomes filled with mud and dirt and affords a less firm

*Soft but not fluid.

support for the blocks than if only of sharp gravel-stones; while the cement fills the joints and the liquids are compelled to run off at the sides.

It may be mentioned that the extra cost of cement filling is but slight, when we consider its advantages.

The paving method before described is only adapted for straight streets and places having a stream of traffic only in one direction and its opposite. For street crossings, irregular streets, squares, etc., it is necessary not only for the durability of the pavement, but for sightliness to employ another method.

Where two streets cross, one of which is much more traveled than the other, then there is used the method shown in fig. 3, the paving of the principal one being continuous, and its border, where it crosses the other one, being reinforced by two or more extra rows across the less traveled one.

Where both streets are equally traveled, then the paving is done as in fig. 4, care being taken that no joints are offered to the wheels. Where a street suddenly widens, as shown in fig. 5, the center line is swerved to correspond.

For irregular places, squares, etc., it is necessary to consider the principal direction of traffic, to accord as far as possible the presentation of lengthwise joints to the wheels, and the placing of triangular "packers" or "fillers" in the middle. An example of proper usage is given in fig. 6.

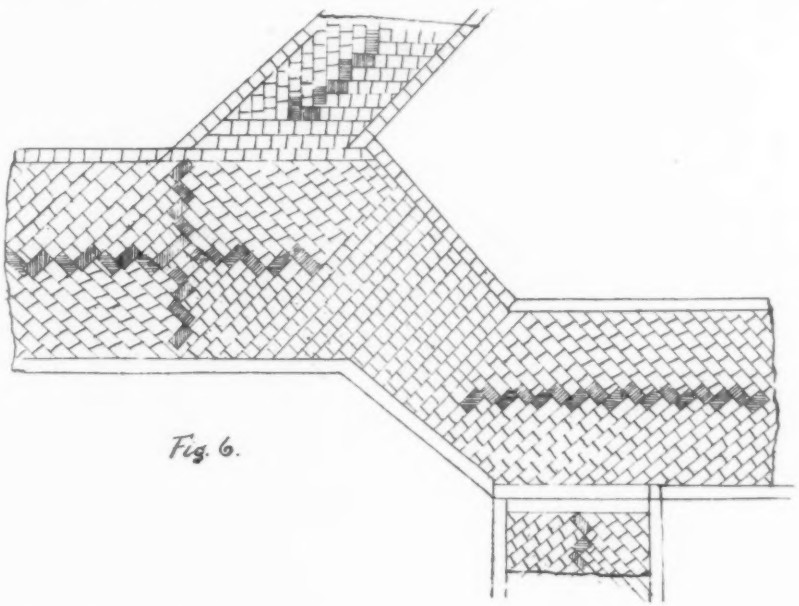

Fig. 6.

In conclusion it may be remarked that where such a granite-cube pavement is properly laid according to the directions above given, it should be good for ten to fifteen years, under the heaviest traffic, without any repairs or attention whatever; and that then it may be taken up, the bed repaired and the stones relaid, opposite side up, giving a second life of equal length, without repairs or attention; after which the blocks may be taken up and used in less traveled streets.

THE FINANCIAL MANAGEMENT OF WATER-WORKS.

*By Freeman C. Coffin, C. E.**

The questions involved in the financial management of water-works are of interest and importance second only to those of successful construction.

This paper will deal only with municipal works; they are more open to investigation and study than are those owned by private companies, and their finances are more a matter of public interest.

Shortly after beginning to collect the statistics for this paper, the writer was appointed one of a committee of the New England Water-Works Association to report upon certain aspects of the financial condition of municipal water-works. I was requested by the chairman of that committee to make some report in connection with this paper. This I have endeavored to do as well as possible with the material available. This has modified the character and scope of the paper, which was at first intended to be a study of statistics of operation, and only incidentally with regard to their bearing on the financial success of the works.

Some questions were raised at the annual convention in June, 1894, that were of importance to all who are interested in water supply and distribution. The raising of these questions led directly to the appointment of the committee referred to. The questions were in substance as follows:

First. Are municipal water-works systems self-supporting, or will the annual receipts meet the annual expenditures for maintenance, interest and depreciation?

Second. Are water rates sometimes lowered to a point that renders the works incapable of producing enough revenue to meet the expenditures?

Third. Is the bonded indebtedness expanded for purposes other than that of legitimate construction?

Fourth. Should not extensions of pipe lines and laying of services and similar construction be classed as maintenance and be paid for from the yearly revenue, such being the policy of private companies?

Fifth. As an inference from the foregoing questions, are water rates generally as high as they should be?

An analysis of these questions is necessary. Some points must be settled and some definitions made before the subject can be intelligently discussed.

At the outset of this study we are met with the fact that there seems to be no generally accepted system of financial management of water-works, or even any well defined and generally accepted principles on which such a system might be founded. Custom and practice vary in different places, and individual works apparently have no consistent theory of procedure. It is hard, if not impossible, to extract required information on important points from the reports of many works.

NOTE.—Those works which have adopted the form of statistics approved by this association are a striking exception to this statement. It is greatly to be regretted that more do not avail themselves of this excellent form, which perhaps leaves nothing to be desired.

In what follows an endeavor will be made to show the need of a consistent and generally accepted the-

* Abstract from paper read before the New England Water-Works Association.

ory of management, and in a tentative and preliminary manner to define the terms or nomenclature of water-works management.

MAINTENANCE.

In no branch of the subject are settled principles or careful definitions more needed than here.

When a report is studied, there should be a fairly clear understanding of what is included under this head. It seems quite certain that such is not always the case at present. There should be a settled agreement as to which items of expense are to be classed as maintenance and which as construction.

The greatest confusion and uncertainty seem to arise in the treatment of extensions of pipe lines and services. In some reports a part of the services are charged to maintenance and part to construction; in one case about twenty-five and seventy-five per cent. respectively.

It has been claimed that as private companies make a practice of paying for ordinary extensions from current receipts, that properly managed municipal works should do the same.

In one respect the management of private is different from that of municipal works. I believe that it is not generally the custom among private works to set aside a yearly sum for the depreciation of the plant, while it is the rule that municipal works do this or cover the same ground in their provision of a sinking fund. This is a condition of the charters under which their bonds are issued. An examination of this subject of a sinking fund and the depreciation of the plant may serve to clear up somewhat this question of maintenance and construction.

DEPRECIATION AND A SINKING FUND.

If a system adds to its construction account each year and makes no provision for the payment of the principal, or for the depreciation of the plant, it would at some future time find itself loaded with a debt and with a worn-out plant on its hands. If it is to go on with its business of supplying water, it must, on account of the deterioration of its plant or the abandonment of some of the same owing to improvements in machinery and other appurtenances of water-works construction, incur large expenditures. Such a course would mean final insolvency or a large and sudden demand on the tax-payers. It is claimed by some that to avoid this result, all *ordinary* extension and construction should be classed as maintenance and be paid from current receipts; that nothing but large or unusual expenditures for construction should be met by the issue of bonds. As it is a general principle that is sought, and as there is no way to definitely draw the line between ordinary and large or unusual construction, a method that leaves to arbitrary judgment the apportionment of such expenditure is unsatisfactory.

When a sum is set aside from the revenue each year, that with its accrued interest is amply sufficient at the end of the life of the works to rebuild or renew them, all legitimate construction may be paid for by the issue of bonds with the provision that for all such construction is provided a sum to cover its depreciation.

In this way the finances of a system are kept in equilibrium. The present is not incurring liabilities for the future to pay, and providing no assets for it to realize upon, nor burdening itself by striving to pay for construction that will benefit the future.

Each year or period of years will pay its own bills and leave the future years to do the same. There

can hardly be injustice in this if construction is not unwisely undertaken.

This system will never place the works out of debt in the sense of paying up all of the bonds, but the point now made is that it is not necessary to good, solvent business management to do so if there are always assets on hand equal to the liabilities.

This provision for depreciation should not be confounded with a sinking fund, although the provision for the latter usually provides for the former.

As I understand the sinking fund, it provides a fund for the payment of the bonds within a certain limit of time. I don't know whether a consideration of the depreciation of the plant originally entered into the provision or not.

The sinking fund period may or may not be identical with the life of the plant. As a matter of fact I believe the maturity of the bonds rarely extends beyond thirty years. Two per cent. of the cost set aside each year will, with accrued interest at three and one-third per cent. per annum, meet the total cost in thirty years.

I believe that one and one-half per cent. of the cost paid each year with the interest will amply cover the depreciation. This percentage with interest at three per cent. will equal the cost in thirty-seven years; at three and one-half per cent. in thirty-five years.

Thirty-five to forty years can hardly be considered excessive for the average life of a well-built plant if it is kept in fair repair.

This percentage for depreciation (if correct) should be the one used when it is desired to find the total annual expenditure that must be met from the revenues when the works are run on a business basis.

If the percentage for a sinking fund is used, and this sinking fund will equal the cost of the works in a shorter period than the average life of the plant, the difference is an asset of the system uncovered by liabilities, and can well be paid by taxation if necessary. If one and one-half per cent. is a fair estimate for depreciation, and two per cent. is paid into the sinking fund, the value of this asset at the time the bonds are paid is one-fourth of their face, or one-fourth the cost of the works.

The foregoing is not an argument against paying for extensions or other construction from current funds if possible; that would certainly be desirable. It is not necessary to sound business management or to the solvency of the works to do so. It may be doubtful if it is good policy to increase water rates for that purpose.

If the question of Construction vs. Maintenance is to be definitely settled and such settlement to be of general application, it must be based upon some fundamental principle. This principle is suggested by the words themselves.

Construction implies new work, something created; labor and material applied to the production of something that did not previously exist in that form or place. It would include all expenditure for increasing or improving the plant in order to secure new sources of revenue; also all renewals of worn-out or superseded parts of the plant. It would not include repairs, care, or minor improvements to existing structures.

Maintenance implies all expense connected with operating and maintaining the works; keeping all parts of the same in good order and condition so far as this can be done by repairs—repairs would include re-

newals of minor parts of a structure, but not a renewal of the structure itself; for instance, the replacing of a broken pipe, but not the relaying of a street line.

It includes all expenditure on the plant necessary to keep it in good condition to meet the demands from its present sources of revenue, but not for enlargements or additions to secure more revenue. Nor does it include the renewals of parts that are worn-out or superseded; the latter are provided for by the sum set aside for depreciation.

The operation of the above principle would classify some items as follows:

MAINTENANCE.

Salaries of permanent officials and employes.
Care and repair of plant.
Pumping expenses.
The expense of the above, with a proper amount for interest and depreciation of the plant, would constitute the total annual expenditure for its operation and should be met from the annual revenue and not by the sale of bonds.

CONSTRUCTION.

New pipe lines.
New services.
New or additional water supplies.
Improvements of supplies, such as filtration plants, clearing mud from basins, draining swamps, etc.
New buildings and machinery, reservoir and stand-pipes.
Renewals on account of deterioration or insufficiency. Sound business management does not require that such items as the above should be paid from the current revenue.

REVENUE.

A clear definition of what constitutes the legitimate revenue of a municipal system of water-works is of importance equal to that of maintenance.

All receipts for water service from private consumers are beyond question part of the revenue.

Is the money appropriated by the municipality for water for public buildings, fountains, street sprinkling, etc., and for hydrant service for fire protection, a legitimate part of the revenue? If so, what relation should the amount bear to the total expenditure, in order that it shall be only a fair return for service rendered and not an unjust burden laid upon the tax-payers that the rates may be low for the benefit of the consumer? The fact must be recognized that the tax-payers and consumers are not identical.

The answer to the question of the equity of a charge for fire protection, and of the proportion of such charge to the total expenditure may be suggested by an examination of the effects of the provision for such protection upon the cost of construction and maintenance.

The provision for adequate fire protection materially increases the cost of construction over that necessary for domestic and manufacturing purposes alone. Although the yearly consumption of water for fire protection is but a small percentage of the total, it must be supplied in large quantities in a short time. This requires that the pipes and machinery shall be of greater capacity and the distributing reservoir larger than for domestic service alone.

The increase of cost may be roughly estimated as follows:

INCREASE IN COST OF CONSTRUCTION FOR FIRE PROTECTION.

For quantity of supply	0
For quality of supply	0
Pumping machinery	100 per cent.
Pumping stations	33 per cent.
Pipe system	100 per cent.
Reservoir or stand-pipe	75 per cent.

Making an average in cost of construction of perhaps 75 per cent.

INCREASE IN COST OF MAINTENANCE.

Care and repairs of pipe system	100 per cent.
Pumping expenses	33 per cent.
Office expenses	0 per cent.
Interest and depreciation	75 per cent.

Or an increase in the total annual expenditure of probably 50 to 75 per cent.; making the additional expenditure due to provision for fire

protection from 33 to 43 per cent. of the total. This estimate can hardly be considered excessive. Mr. J. Herbert Shedd, a member of this association, places the proportion at 50 per cent.*

As the benefits arising from this fire protection inure to tax-payers and not to the water consumers, it is only just that at least the additional expense caused by it should be borne by the former.

Viewing the subject from another standpoint, when the system is owned by a private company, a hydrant rental is usually paid by the municipality and raised by taxation. This rental will probably average not less than $30 per hydrant per annum.

A price per hydrant is not a correct measure of the value of fire service unless the number of hydrants is also considered. The piping system would necessarily be of as great capacity (and should be greater) when the hydrants are far apart as when they are near together. Perhaps a more correct basis would be so much per hydrant and so many hydrants per mile of pipe. The present practice is to place hydrants too far apart. Viewed from a financial standpoint, this is poor policy, especially where the municipality owns the works. It necessitates the use of long lines of hose, greatly decreasing the efficiency of the works.

Undoubtedly the increased expenditure in construction caused by a generous number of hydrants will increase the real efficiency of the system for fire protection much more than the same expenditure in any other direction. It must be remembered that the ideal system would be one in which the static head and the dynamic head at the nozzle were the same, and the best designed works are those that come nearest to this ideal. It should be the constant endeavor in designing a distribution system to secure a proper efficiency at the nozzle with the least possible static head, ever mindful that the interest and depreciation on the increased cost of construction must not exceed the amount saved in running expenses. The economic ideal of design is that in any contemplated improvement the interest and depreciation shall about equal the saving in operating expenses. Sometimes, unfortunately, all question of permanent economy must give way to a necessity for small first cost.

Suppose a street 3,000 feet long with six hydrants placed 600 feet apart on a six-inch main fed from both ends. Four fire streams of 200 gallons each are needed at a building about midway between two hydrants. Not less than 300 feet of hose would be required for each stream. If five more hydrants were placed upon this line, reducing the distance apart to 300 feet, 150 feet of hose would answer equally as well as 300 feet in the first instance. The loss of head by friction in the hose would be reduced 31 feet, while the cost of the five hydrants would be about $250. This would be partially offset by the saving of wear in 600 feet of hose dispensed with. On the other hand, if the size of the pipe were increased to eight-inch, and the hydrants remain as at first, the loss of head would be reduced about 20 feet, and the increased cost would be about $650; or by doubling the number of hydrants 31 feet head would be saved at a cost of $250 or less; by increasing the size of the

* See discussion of J. R. Freeman's paper on "Fire Streams" in the Journal of N. E. W. W. Association of March, 1890.

pipe from six to eight-inch, 20 feet head would be saved at a cost of $650.

To return to the subject of revenue. In view of the foregoing, if in any system the amount appropriated by the municipality for fire service does not exceed 50 per cent. of the total annual expenditure including interest and depreciation, the tax-payers are not contributing more than is just toward the support of the works, considering that to supply the consumers alone but from 57 to 67 per cent. of the total would be required, while to give fire protection alone, probably not less than that percentage would be needed.

It may also be said that if the amount appropriated for fire protection did not exceed $30 per hydrant, it would not be excessive, although this is not so correct a standard owing to the great variation in the number of hydrants per mile in different places.

This reasoning is based upon the assumption that the fire service is such as would be considered by competent authority an efficient one for the place in question.

WATER FOR PUBLIC PURPOSES.

There is one more legitimate source of revenue: This is for the water used in public buildings, for ornamental and drinking fountains, street sprinkling and for flushing sewers. In regard to the quantity used for these purposes, I will quote as follows from a paper read before the American Society of Civil Engineers in June, 1895, by Mr. Dexter Brackett, a member of the association: "The quantity of water used for these purposes varies to a great extent in different cities on account of the difference in the method of supply. In some cases no charge is made for water for public purposes, while in others the water is supplied through meters, and the water department is paid for all water used. Where no charge is made, the consumption is apt to be excessive. * * * A careful study of the quantity required for different public uses based upon such information as the author has been able to obtain, gives the following requirements for the different purposes:

Public buildings, schools and hospitals	[2.30—Ed.]
Street sprinkling	1.00
Flushing sewers and public urinals	.10
Ornamental and drinking fountains	.25
Fires	.10
Total for public purposes	3.75

"Probably four or five gallons per capita should cover all requirements for public purposes."

In making an estimate for general application it would not be excessive to allow three gallons per capita for all public purposes except fires, and from 15 to 20 cents per 1,000 gallons would not be too high a price.

It follows then, that there are three main sources of revenue:

1. Rates paid by all classes of private consumers.

2. Revenue received for water for public purposes.

3. Appropriation for fire protection.

If in any system the aggregate receipts from these sources equals or exceeds the total annual expenditure including interest on the cost and a proper sum for depreciation, the works are self-supporting and may be said to be run upon business principles, with no discrimination in favor of either consumer or tax-payer.

SUCCESSFUL PUBLIC WATER-WORKS PLANT.

By Capt. S. H. Finley, C. E.

The practicability of the public ownership of water-works is a much mooted question, and as it, like most others, must be decided on practical and experimental knowledge rather than theoretical, it will not be out of place to give a brief statement of the result of public ownership at Santa Ana, Cal., which is most encouraging to the advocate of public control.

The plant was completed and commenced operation September 1, 1891, at a cost of $60,000. Since that time extensions and additions, including expenses of connections, have been made to the value of $15,500, making the present total cost of the plant, exclusive of incidental expenses, $75,500.

At the end of the first year there were 280, the second year 475, the third year 555, the fourth year 610 and at the present time (September 1, 1896), 684 consumers. There is a total monthly income of $682.25 at the present time; being an average of a fraction less than one dollar each for all patrons, including one who pays $50 and another $25 per month. Excluding the two large consumers, the average rate is about 90 cents. The rate is fixed at $1 for residences with no extra charge for lawns and shrubbery, the idea being to encourage the cultivation of these ornaments. The minimum rate for stores is 25 cents.

To get a proper understanding of the income it will be necessary to include, in addition to the actual cash receipts, as above, the amount which the city would have otherwise had to pay to private parties for water for use on streets and for fire protection. Before constructing the works an effort was made to get private parties to take hold of the proposition, and the most reasonable offer made was 20 cents per thousand gallons for street sprinkling, and $50 per annum for first fifty fire hydrants and $30 for all additional ones. An average of 85,000 gallons for each of the 300 working days during the year is used for street sprinkling, which, at the above rate, would be $5,100.

Seventy fire hydrants are in use, which, at the above rate, would amount to $3,100 per annum. These rates are perhaps excessive, but reducing the rate for water to 10 cents per thousand gallons, and hydrants to $35 each, we have the total income at present to be as follows:

	Per Mo.	*Per Yr.*
From private consumers	($682.25)	$8,187
Water for streets		2,550
Fire hydrants		2,450
Total		$13,187

The expense account stands as follows, charging to it a proportionate amount of the salary of the city clerk, who does the collecting at his office, and street superintendent who attends to the outside work:

Steam engineers	$1,560
Collecting	420
Superintending	480
Incidentals and repairs	240
Fuel	2,737
Interest and depreciation 10 per cent. (liberal)	7,650
Total	$13,087

Thus it is seen that at the very low rates established the income even now more than pays all expenses, interest and depreciation, having no additional burden to be borne by general taxation. A few

other points that may be of interest are as follows:

The plant is the direct pressure system, pressure maintained by pumps 24 hours per day. The source of supply is a 350,000 gallon reservoir, fed from four artesian wells. The average amount pumped per day, piston measurement, is 350,000 gallons. The population of the city is about 5,000.

The success of the experiment has been very gratifying, not only to the individual consumer, who has an abundance of pure water at a nominal rate, but also to the public in general who are saved the burden of paying excessive rates for water for public use. The additional income from this time on will be practically net, as the expenses will not be materially increased.

THE CHEMICAL RELATIONS OF ASPHALTUM.

NO. V.

By Prof. S. F. Peckham.

NOTE.—It is with much regret that I read in the September number of this journal the interesting article by Mr. Malo. This distinguished gentleman has entirely failed to understand the article which he criticises. It was to help, not hinder, the use of the nomenclature that he suggested, that I wrote the article in question. The word from which *asphalt* and *asphaltum* are derived was used by Aristotle, 2,000 years ago, to designate the bitumen of the Dead Sea. The word asphalt has passed into general use in the civilized world to designate the solid forms of bitumen. Mr. Malo seeks to restrict this use to one variety of impure bitumen of which the ancient world knew nothing. I advocated the use of the word as he suggested, and proposed, in order to avoid confusion, that the word when used to designate "asphaltic rock" should be spelled *asphalte*, with a final e, in all modern languages. I am still of the same opinion. S. F. P.

I presume that by this time my readers are asking what has what I have written to do with the chemical relations of asphaltum? I frankly admit that the relation is so indirect as scarcely to be apparent. No problems associated with the French asphaltes have been submitted to chemists, so far as I am informed.

Boussingault worked upon the maltha of Bechelbronn, which has never been of any commercial importance. Moreover, Boussingault's memoir has no significance as a chemical research at the present time, except as having given names which have been used in a manner that he did not intend; and which apparently correllate his work with that of recent years, while in reality they do not. Boussingault distilled off a certain portion of the maltha and called it *petrolene*, and the residue he called *asphaltene*. He did not investigate asphaltum, and as he applied his method he admitted that it was inexact. His research is of historic and negative value, but does not furnish us with any data available at this time.

Later Le Bel and Muntz, by simi-

lar methods applied to other bitumens, obtained additional results, of but little more value, none of which gave any data concerning the asphalte used for street paving in Europe.

I know of no research that has added anything to the sum of human knowledge concerning asphalte from any locality, or that furnishes any data whereby any scientific distinctions can be made between those from different localities, or that explains any of the technical methods that are employed in street paving with asphalte, or that assigns upon scientific grounds any cause for failure or success by different methods of treatment. The technique employed by the engineers who have become the masters of the art in Europe, as described by those masters for the last forty-six years, consists of processes governed by pure "rule of thumb." The details of the work performed in London and Paris, at a cost of tens of thousands of pounds sterling and millions of francs, exhibit an amazing disregard of principles that appear to be fundamental. How engineers trained in the schools of England and France could expect a lime concrete to set out of contact with the external air is marvelous, when it is well known that lime mortar in chimneys centuries old is seldom, if ever, fully set; that is, entirely free from calcium hydrate. Again, to expect concrete to stand over wet clay or sand, where frost can reach them, is almost equally marvelous. It really seems, with all such blunders and empiricism, as if asphalte, after all, notwithstanding it has "the defects of its qualities," can, like the human body, be abused almost beyond belief, and still make the best street that can be constructed.

However, "rule of thumb" is based on fundamental chemical laws, that we may be too ignorant or heedless to recognize; yet, which, in their invariable action, make precedent and routine possible, and lend to methods learned by experience that exactness that makes empirical technology possible. Yet, such knowledge is gained at enormous expense, but the great cities of London and Paris have paid the bills, and the companies that lay asphalte go on declaring their dividends and the engineers in charge receive their salaries. None of the money is thrown away on chemists. The trouble is, as is easily determined by perusing the papers from which I have quoted, the experience gained since 1843 is to-day just as heterogeneous a mass of empirical knowledge as it was in 1850 when M. De Coulaine published his interesting and valuable paper. No system has been evolved, no theory has been possible based upon strictly scientific principles. Nature has not been interrogated. No intelligent connection of mistakes has been made and no standpoints have been gained from which one could reach out after more complete and accurate knowledge. Conclusions have been reached and expressed as matters of opinion, not as well-grounded facts based upon well determined physical and chemical laws.

It is true analyses have been published. Mr. Delano affirms that the composition of the bitumen in Seyssel asphalte is:

Carbon	85 parts.
Hydrogen	12 parts.
Oxygen	3 parts.

He also says that according to Boussingault bitumen is composed of:

Carbon	85 parts.
Hydrogen	12 parts.
Oxygen	3 parts.

Boussingault's results were pub-

lished fifty-nine years ago, and chemists have since discovered that there are a great many varieties of bitumen, all of which are complex mixtures of hydrocarbons, with or without compounds of oxygen, sulphur and nitrogen.

In an appendix to one of Mr. Delano's papers he gives a report upon an examination of several asphaltes, the results of which are given in a table, which I quote as follows:

No. 1 was from Val de Travers, Switzerland.
No. 2 was from Lobsan, Alsace.
No. 3 was from Macstu, Spain.
No. 4 was from Ragusa, Sicily.

	1.	2.	3.	4.
Water and matter volatile under 100° C.	0.35	3.40	0.40	0.80
Soluble in sulphuret of carbon (bitumen)	8.70	11.90	8.80	8.85
Sand	.60	3.05	57.40	0.60
Zinc, or combined silicate	....	....	11.35	....
Sulphur	0.08	4.99	trace	....
Iron combined with sulphur	0.21	4.44	....	....
Alumina and peroxide of iron	0.30	1.25	Al_2O_3 3.35 Fe_2O_3 1.00	0.90
Lime	49.50	38.90	5.70	49.00
Magnesia	0.10	0.15	3.85	0.45
Carbonic acid and waste	40.16	31.92	8.15	39.40
	100.00	100.00	100.00	100.00

The analyst makes the following remarks:

"Sample No. 1 is an almost pure limestone, impregnated with bitumen. It is asphalt in the proper sense of the word."

"Sample No. 2 is also composed of asphalt. It does not contain any appreciable quantity of clay, as was presumed; but there is found 9½ per cent. of pyrites, or bisulphuret of iron. Pyrites may become the cause of failure in the use of this material; by the heating to which the material is subjected in its preparation, one-half the sulphur may become transformed into proto-sulphuret of iron, an oxidizable matter which by exposure to the atmosphere becomes a soluble salt, viz., sulphate of iron. Thus disaggregation may result shortly after the laying down."

"Sample No. 3 is not, properly speaking, an asphalt. It is a silicious rock, somewhat argillaceous and impregnated with bitumen. It does not contain any pyrites, and would therefore be free from the accident mentioned above."

"No. 4 is an asphalt almost absolutely pure."

The report is signed:

"DURAND-CLAYE,
"Engineer-in-Chief, Director of the Laboratory,
"Paris, 13th December, 1878."

This report is subject to the following criticism from the standpoint of chemical technology, and while it can be justly claimed that facts known at the time it is dated did not warrant such criticism, it can be as justly asserted that such a claim does not stand to the credit of the investigators of that period.

The first item reported is "water and volatile matter at 100° Centigrade. Water is a variable and accidental *impurity* of all asphaltes. Volatile matter other than water is a part of the bitumen. While the report recognizes the fact that the matter volatile under 100° C., may not be all water, no attempt is made to distinguish whether the matter is all water or all bitumen, or, as is most likely, a part one and a part the other. The second item is "matters soluble in sulphuret of carbon (bitumen)." Very few, if any, bitumens yield all of their hydrocarbons to solution in carbon di-sulphide; therefore, by this method of analysis, a part of the bitumen is lost under 100° C., the larger part dissolves in carbon di-sulphide and the remainder is lost and determined in the last item as "waste." Moreover, this method by which over ninety per cent. of the bitumen is dissolved in carbon di-sulphide from all the specimens alike while the remainder is lost, does not even determine the amount of bitumen accurately and does not

distinguish in any manner whatsoever the character of the bitumen. It assumes, on the basis of a conjecture, that the bitumen in all three specimens of asphalte is identical, which may or may not be the case. The sixth item is sulphur, and the seventh is iron combined with sulphur. In the remarks the two are added together and estimated as iron pyrites. It is a very important matter to determine whether the sulphur exists in the asphalte as sulphur, sulphates or iron pyrites. Sulphur may be dissolved in the bitumen or it may be a constituent part of a chemical compound that forms a part of the bitumen. Sulphates might result from oxidation of the pyrites or a reaction between sulphur dissolved in the bitumen and the bitumen itself, whereby hydrogen sulphide is first formed and then oxidized. If the bitumen were heated to a temperature that would decompose the pyrites (which is not at all likely), the sulphur set free would immediately combine with the hydrogen of the bitumen, producing hydrogen sulphide, and practically burn out the hydrogen from the bitumen, making it brittle. If iron pyrites remained in the asphalte when laid, it would oxidize when exposed to the air and rain, and would cause the roadway to disintegrate.

These problems are the problems of chemistry and not of engineering.

Although it is asserted in one of the papers quoted that the bitumen in Bastennes tar is identical with that in Val de Travers asphalte, no proof of such identity is offered and no research to prove their identity has ever been undertaken, to my knowledge. The fact is, that after a century of guessing respecting the composition of these minerals, we are still guessing. Engineers have been attempting the problems of chemists, and while their rule of thumb analyses are in some respects better than nothing, they are not creditable to a technology involving the expenditure of vast sums of money in this age of exhaustive and accurate scientific research.

No real or satisfactory progress is possible until the elements of this problem are determined along the whole line, from the rock in the quarry to the finished street, not in the light of blind experiment alone, but in that of well directed chemical and physical research.

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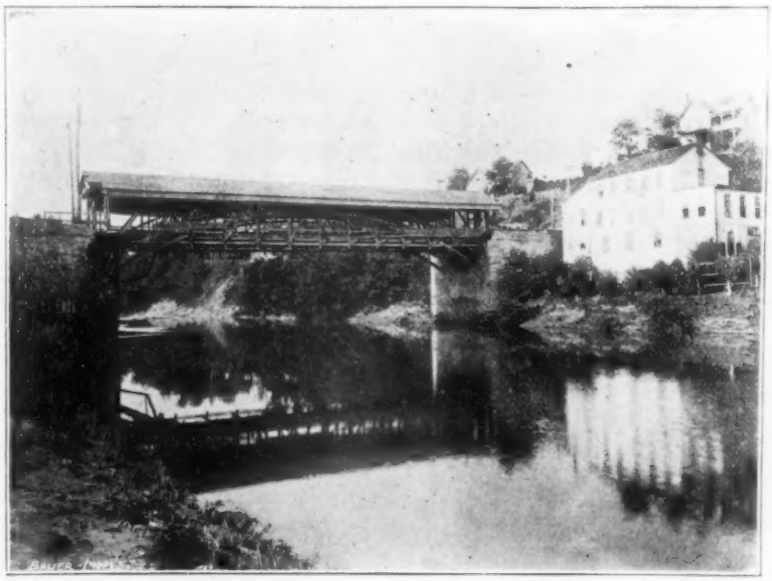
[1] Proceedings of the Institution of Civil Engineers, Vol. LX, 1879-80. A. H. Allen, Commercial Organic Analysis, Vol. II, page 374.

THE NATIONAL BRIDGE OVER WHITEWATER RIVER.

By H. L. Weber, City Engineer of Richmond, Ind.

The sacrifice of beauty and careful workmanship to economy in engineering works is so common that a structure in which symmetry and honest workmanship are made prominent features, especially in a a part of the country at the time of its early settlement, is worthy of more than ordinary notice and its projectors of more than ordinary credit. The national bridge at Richmond, Ind., from which the accompanying picture is taken, is such a work. It was built

by an appropriation from the government at the time of making the national road from the capital city to St. Louis, which amounted to about $6,000, a sum that at that time was a large expenditure, as the wages paid an ordinary mechanic on the bridge was about $8 per month. It has now been standing over sixty-three years and the timbers not exposed to the elements show no signs of decay even at this time. The entire bridge is of white oak and was whipsawed into the required shapes. The bridge was first put together on the public square, each piece being cut as needed, and then allowed to lay over a year until the stonework could be completed. The large wooden pillars at the ends were turned by hand, while the 7x12-inch floor beams were hewn directly from the logs. The span of 120 feet is supported by seven arches each of which is composed of two 4x10-inch timbers bolted together at the panel ends with the vertical truss member between them. The pieces have been well protected from the elements by blinds which inclosed solidly the two roadways and added much to the appearance of the bridge. Much difficulty was experienced in reaching a foundation for the east abutment which is the weakest part of the bridge, as quicksand was found near the surface. An Archimedean screw cut from a log by hand furnished the only available means of getting out the water. On account of the bad condition of this abutment it was necessary to remove the sidewalks and other unnecessary weight which detracts largely from the appearance of the bridge in the picture. The stonework was done by Col. Benjamin Sayres who took all the material from the bluffs near the bridge. It is stratified limestone that does not stand the action of the weather. The superstructure was built by two



THE NATIONAL BRIDGE OVER WHITEWATER RIVER.

brothers, Channing A. and Tyndal Madison.

Work has already been begun on a much larger iron viaduct to take the place of the old wooden bridge which is now closed to traffic. The new one is to be 640 feet in length, of seven spans, supported by two rocker bents and four tower bents; two spans are 40 feet, four spans are 80 feet, one river span is 160 feet; the roadway is soft, and is to be paved with cedar block on a concrete base; the sidewalks are 6 feet each and are to be of cement. The entire viaduct is on a 2.553 per cent. grade.

COST OF SINGLE-COURSE BRICK STREET PAVEMENT.

*By T. S. McClanahan, C. E.**

First, the excavation was in accordance with figures on grade stakes for cuts and fills. The fills were made by spreading the earth to a depth of .5 of a foot, then rolling and continuing to do so until the proper elevation was reached, forming an 8-inch crown in a road bed 30 feet wide, and when crowned it was thoroughly rolled.

Where there was a cut the cut was made to within about 4 inches of the proper grade by plows and scrapers, and the last 4 inches was cut with mattock and shovel, forming the exact crown of the finished pavement. Then, after finishing grade, the curb was set in trenches on 4 inches of sand, with vitrified brick embedded in the sand every 2 feet. The bricks were laid crosswise in the trench, the curb placed on them and brought to the exact grade, then thoroughly tamped on the inside up as high as the subgrade. This work must be done well and complete, and then tamp the outside of the curb to the top of the curb. This must be done in order to make the curb a complete support to the crown or arch of the pavement; the top of the curb being the exact grade of the street.

After the curb has been set as above, then roll with a 5-ton roller, or with a roller of sufficient weight, and continue to roll until the subgrade is solid—that means solid.

I finished this work with a crown of 8 inches in 30 feet; then a cushion of sand 5 inches in thickness and well tamped with a 12-inch square tamper; then a single course of No. 1 paving brick set on their edges and crosswise of the street, with their ends laid close together, and a firm, tight finish of each and every course made at the curb. The curb is 5 inches by 24 inches by 6 feet, the top of which is 2 inches under the top of the crown in pavement, leaving 6-inch gutter. We fill the interstices between the bricks in the pavement by spreading over it clean, dry sand, swept into the cracks and crevices with a broom. Then we rolled the pavement with a 5-ton roller, beginning at the sides and working to the center, until the pavement is settled.

COST OF THE ABOVE.

Excavating 4,925 cu. yds. of earth, average length of haul 800 feet, at 14 cts.	$689.50
2,805 lineal feet of curb, 5-in. x 24-in. x 6-ft. f. o. b. Monmouth at 28 cts. per lineal foot	785.40
Hauling 2,805 feet curb at 3 cts.	84.15
Dressing " " " " 5 "	140.25
Setting " " " " 5 "	140.25
Profit " " " " 5 "	140.25

* Abstract from paper read before the Illinois Society of Engineers.

4,878.1 square yards of paving as follows:	
322,000 brick delivered on street at $10 per M	$3,220.00
Laying 4,878.1 square yards paving at 10 cts. per yard	487.81
4,878.1 square yds. of sand 5 inches thick at 10½	512 19
Profit	706.89
Total	$6,906.68
Engineering and superintending	$75.00
	$6,981.68

The length of this improvement is 1,350 feet, not counting the laterals at the two intersections. Therefore, the average cost per foot front on each side would be $2.58½, or per square yard, $1.43.

OPINIONS OF MANUFACTURERS AS TO PROPER RELATION OF CONSTITUENTS OF PORTLAND CEMENT.

A series of questions were recently submitted by MUNICIPAL ENGINEERING to some of the leading Portland cement manufacturers in America, for the purpose of ascertaining their opinions on the subject of the proper constituents and proportions thereof in Portland cement. The questions are published below, and some of the answers follow. This information will be made the basis of further discussion of this important subject in MUNICIPAL ENGINEERING in later numbers. The questions are answered by the manufacturers in the order in which they are numbered as follows:

QUESTIONS.

1. What do you consider to be the proper relation among the following constituents of Portland cement: Lime, magnesia, silica, alumina, iron oxide?
2. What is the allowable limit of (combined) magnesia in Portland cement?
3. Does this limit depend at all on whether the cement is to be used in sea water?
4. Is *free* magnesia more harmful to a cement than *free* lime?
5. What is the allowable limit of sulphuric acid in Portland cement for use in sea water?
6. What is the allowable limit of sulphuric acid in Portland cement to be used elsewhere than in sea water?
7. Do you consider that the addition of sulphate of lime to Portland cement after burning is a reprehensible practice, and if not, what would you consider the safe limit of such addition?
8. Is alumina a desirable constituent in Portland cement and within what limits should its percentage be restricted?
9. What is the allowable limit of oxide of iron in Portland cement?

FROM S. B. NEWBERRY, MANAGER OF SANDUSKY PORTLAND CEMENT COMPANY.

1. Lime should be about equal to 2.8 times the silica present, plus 1.1 times the alumina present. German authorities claim that the magnesia over 3½ per cent. is injurious. This is still under discussion, and is being carefully investigated by a committee of the German Cement Manufacturers' Association. I know of no evidence showing oxide of iron to be harmful in ordinary proportions.

2. It is doubtful if magnesia is ever combined in Portland cement. Our own experiments tend to confirm the opinion of many German authorities that magnesia remains *free* in cement, and does not combine with the constituents of clay after the manner of lime.

3. The question of the action of sea water is still being investigated by a committee of the association of German cement manufacturers. So far as I know magnesia has not been proved to make cements more liable to injury by sea water.

4. Certainly not. Free magnesia, calcined at high temperature,

does not slake in water, but slowly hardens like cement. It shows some tendency to expand and crack at long periods. Dyckerhoff found actual cracking of cement to take place after several years with 8 per cent. or more of magnesia. He found 3 ½ per cent. or less to show absolutely no harmful results.

5. This is not determined, nor is it *proved*, so far as I know, that sulphate of lime renders cements more likely to be affected by sea water. This subject is being investigated by the committee referred to, at the island of Sylt in Germany.

6. Not determined.

7. This practice is almost universal, and is distinctly allowed by the requirements of the German minister of public works to the amount of 2 per cent. I have analyzed several German and English Portland cements, and found free plaster (sulphate of lime) in all of them.

8. Alumina is absolutely necessary to bring about a good combination between lime and silica. Our experiments show 2 per cent. alumina to be sufficient, though the highest strength was shown by cements containing 4 to 5 per cent. alumina. High percentages (10–12 per cent.) make the cement quick setting and weak.

9. Bad effect of high percentage of oxide of iron has not been proved. Oxide of iron combines with lime, but the product shows no hydraulic properties. Oxide of iron is *useless* in cement, the necessary materials being silica, alumina and lime only.

FROM THE BUCKEYE PORTLAND CEMENT COMPANY.

To the Editor of Municipal Engineering:

Your request for our experience in proportioning lime, silica, etc., in the manufacture of Portland cement is received.

Our experience with our materials would not be the same as others, experience with different materials.

To make the best Portland cement every change in the quality and proportion of one of the materials requires, to a more or less extent, a change in the proportion of each of the others and of the subsequent treatment.

An intelligent answer to your questions would require an accurate knowledge of the silica—what portion would under the conditions combine with the lime—and of the iron, sulphuric acid and alkalies. The following proportions and remarks will apply to most materials:

1. The silica that will combine and the alumina should be nearly 44 per cent. of the lime and magnesia after the sulphuric acid has been supplied. Silica, alumina and iron sesquioxide should approach 50 per cent. of the lime and magnesia. There should be enough iron sesquioxide and alkalies to bring about the kiln action, but not over 4 per cent. of the iron.

2. In the above proportion there should not be over 2 or 3 per cent. of magnesia. It is thought by some that magnesia can be substituted for part of the lime at the ratio of 1 of magnesia for 1.4 of lime, if proper adjustment of fluxes and fusing temperature can be obtained.

3. There would be some difference in the effect of sea water and fresh water with a high percentage of magnesia.

4. We doubt if it is.

5. One per cent. is probably a fair limit.

6. Two per cent. is safe.

7. It retards the setting, assists the seven-day test and the hot-water tests. Ultimately it is an injury to

a really good cement. Two per cent. can be added usually, but the best proportion to bring about above-mentioned results and still be safe can only be determined by trial.

8. Alumina is not essential, but is more desirable than any other material that it is practical to use in its place.

G. W. BARTHOLOMEW, JR.
Bellefontaine, Ohio, Aug. 18.

FROM GLEN FALLS PORTLAND CEMENT CO.

1. The range of percentages should be as follows:

	Per Cent.	We Would Prefer
Silica	20.50 to 26	22.
Alumina	5.50 to 10.50	8.
Oxide of iron	2.00 to 5.50	2.50
Lime	58.00 to 66.00	63.50
Magnesia	0.50 to 2.50	1.00
Sulphuric acid	0.50 to 2.00	1.00

2. 2 to 3 per cent.

3. No.

4. About the same.

5. 2 per cent.

6. 2 to 3 per cent.

7. Not reprehensible; 2 per cent.

8. Should be restricted to about 8 per cent.

9. About 5 per cent.; would prefer 2.50 per cent.

FROM MANKATO CEMENT WORKS.

1. There are many combinations of the constituents in a Portland cement, which may be proper, and the question, as it is put, can not be briefly answered. The following combinations are chemically correct:

	No. 1.	No. 2.	No. 3.	No. 4.
Silica	24.41	29.14	31.94	30.89
Lime	45.52	54.34	59.54	57.19
Magnesia	16.24	.....	.....	1.10
Alumina	13.83	16.52	8.52	10.82
Totals	100.00	100.00	100.00	100.00

There are other combinations equally proper. Oxide of iron simply gives color. It is not a necessity. A perfect cement would be white.

2. The answer is found in the first column of the foregoing combinations, which show the limit for magnesia, with the amount of silica and lime as given.

3. The limit does not depend on whether the cement is to be used in sea water. Magnesia is a better base than lime if used in sea water. A pure silicate of magnesia, *i. e.*, silica, 42.91, magnesia, 57.09, would make a perfect sea water cement, and be durable in air or fresh water.

4. Free magnesia is no more harmful than free lime in a cement, and neither is harmful if not in excessive quantity when thoroughly hydrated.

5. There is no allowable amount of sulphuric acid in a Portland cement. It is never found *free* in a cement. It is found only when in combination with lime, *i. e.*, as sulphate of lime. It is used to effect high short time tests, and is a damage, as it is not hydraulic. It should not be used, whether in air, fresh or salt water.

6. Your sixth question is answered in the fifth.

7. Your seventh question is also answered in the fifth.

8. Alumina is not a necessity in a cement, but is present by reason of the fact that silica is not found in a condition fine enough for the purpose, except in combination with alumina, as in clay. Its limit is found in column No. 1, in the answer to the first question.

9. Oxide of iron is not harmful up to five (5) per cent. It simply gives color to a cement, as stated in my first answer. It is an adulterant, and the prejudice in favor of any color is not well founded.

P. S. CARNEY,
Lessee and General Manager Mankato Cement Works.

FROM WILLIAM PLANKINTON, PRESIDENT WESTERN PORTLAND CEMENT COMPANY.

1.

$$\frac{\text{Lime} + \text{Magnesia}}{\text{Silica} + \text{Alumina} + \text{Oxide of Iron}}$$

should equal 1.8 to 2.0.

2. Three per cent.

3. Yes, for the reason that it hydrates slower.

6. Three per cent.

7. Half of one per cent. of sulphate of lime added will spoil one cement, while two or even three per cent. will greatly improve another cement.

8. I think it is, but it ought not to exceed 8 per cent.

9. Five per cent.

THE QUESTION DEPARTMENT.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

REFILLING OF JOINTS OF GRANITE PAVEMENT.

Can the joints of a granite pavement be refilled, and how? *J. P. Q.*

If a granite pavement has not worn too much and if it is laid on concrete, the joints between the blocks may be successfully refilled. But if it is laid in sand it is not advisable to waste any labor and material on this kind of repair, for the sinking and rising of the blocks from traffic, rain and frost would soon break up the joints again. To refill the joints, care must be taken to first clean the joints thoroughly of all dust, sand, filth and spongy matter that may have accumulated. This can be accomplished by putting a force of men to work and have them sweep the pavement first and the joints afterward, perfectly clean with stiff brooms. This done, the pavement must be left to dry between the joints, and the work of refilling must not be begun until all dampness has disappeared. It is best to once more sweep the pavement just before refilling the joints so as to remove all dust that may have again gathered during the time of drying. The method of refilling is, to refill the joints where needed with hot gravel and then pour the hot "paving cement" into the joints. This bituminous cement was described in the September number of this magazine, page 154. It is true economy to refill the joints of good granite pavements. It adds to the comfort of vehicles, makes traction easier and cleaning more efficient.

RELATION OF COLOR TO QUALITY OF CEMENT.

Has the color of cement anything to do with its quality? *A. M. A., Syracuse.*

As a rule, no. If a cement is very light colored, it is well to test it for strength, also for lime or possible adulteration with clay.

If the cement is very dark, lamp black may have been added to deceive. Test for lamp black by dissolving in water, when, if present, an oily black film appears on the water. Lamp black of itself does no harm, more than to deceive ignorant buyers who think "good dark color means good strong cement." Color, smell and feeling have very little to do with the value of a cement. Tests made with briquettes in tention are sure indicators of its value.

It is surprising how many contractors and even cities trust entirely to the "brand," the manufacturers or even the contractor, for a good cement. Cement tests are

quickly and cheaply made, and should never be omitted in public or private important work.

TRAP-ROCK IN CONCRETE.

The owner of a trap-rock quarry is trying to have our city specify the use of crushed trap-rock in concrete. Is not crushed limestone better?

W. E. Evans, C. E.

For concrete foundations made from cement, sand and crushed stone, one kind of stone is as good as another. Even crushed furnace slag or broken brick are good. The material should be crushed in pieces as nearly cubical as possible—not flat, thin chips. It should be free from dust and earth. The best concrete is made by moistening slightly the crushed stone before incorporating it with the mortar of cement and sand. Limestone is cheaper to crush and is therefore cheaper than trap, and is just as good for concrete under pavements and many other places. But for concrete foundation exposed to salt water, it is believed to be best to prefer crushed trap-rock.

ROCK ASPHALT AND KENTUCKY ASPHALTIC SANDSTONE.

The enclosed clipping is from the *Courier-Journal* of Louisville, Ky., July 24, '96: 1. Is rock asphalt fit in crude state for pavement? 2. What kind? 3. Where from? 4. Is the "black rock" of Kentucky good for pavements without preparation with other materials? 5. What is asphaltum-tar? 6. What is a safe thickness for asphalt pavement? 7. What are the mixtures used in Trinidad, Bermudez and similar asphalt pavements and why? 8. The spirit of the statements in this clipping does not seem to be one of scientific investigation, but nevertheless suggests the above questions.

George Wolf, Louisville, Ky.

The clipping requires little comment beyond stating that inquiry by MUNICIPAL ENGINEERING shows that the Trinidad asphalt lake is leased by the Trinidad Asphalt Co. Asphaltic sandstone is found in Kentucky and is different from the asphaltic limestones found in Germany, France and elsewhere. Answering your questions by numbers, it is proper to state that they are worthy of more space than can be given in this department.

1. Rock asphalt is commercially the name, in all parts of the world, except at a few places in England and in France, where it is called "asphalte," the name given it by a large French company which manages the deposits of this material at Seyssel and Mons, France. Rock asphalt is an asphaltic limestone. That which has a commercial value for pavements contains from 8 to 20 per cent. of asphaltum, the rest being compact, fine limestone with a small trace of other minerals. Natural rock asphalt (asphaltic limestone) is, some of it, suited in a crude state for grinding, pulverizing, heating and compressing upon a roadway for pavement. Most of it, however, is brought to the required per cent. of asphaltum by mixing one or more crude rock asphalts in order to obtain 10 per cent. more or less of asphaltum in the compound as required for pavements.

2. The kind of rock asphalt which can be ground, pulverized, heated and compressed into pavement, is asphaltic limestone with the proper per cent. of asphaltum in it, provided it is fine, homogeneous and has otherwise proved itself suitable for the purpose.

3. Asphaltic limestone for pavements comes from Seyssel, Mons and elsewhere in France; from Val de Travers, Switzerland; Limmer and Vorwohle and elsewhere in Germany, as well as from several points in Italy and Sicily. Rock asphalt is also found and mined at a few points in Russia. There are a few outcroppings of asphaltic limestone, which has not yet proved

itself of much commercial value, in Utah, Indian Territory and Texas.

4. The "black rock," of Kentucky, is so called by the farmers. It is an asphaltic sandstone, known by some as bituminous sandstone, and can not be used for pavements without preparation and an admixture of other materials. From the best information available, it appears to be still an experiment, having failed in several cities for causes unknown to us, while apparently succeeding at a few points.

5. There is no such material as asphaltum-tar. Asphaltum is a natural mineral pitch. It is one of the bitumens to which petroleum, maltha, asphaltum, gilsonite, etc., belong. Tar is a by-product of the gas works and is usually called coal tar or gas tar. They differ in composition, quality and uses. It is never well to permit tar to be used in connection with asphalt pavement.

6. The several thicknesses for asphalt pavement are for heavy traffic 5-inch concrete, 1½-inch binder (or bituminous concrete), 2 inches asphalt surface. For light traffic 4 inches of concrete, 1 inch binder, 1½ inches asphalt surface. This pertains to mixtures made from Trinidad, Bermudez, California and similar asphalt pavements, as well as to the rock asphalt class.

7. The mixtures used are asphaltic cement, 12 to 15 per cent.; sand, 83 to 70 per cent.; powdered limestone, 5 to 15 per cent. The reason the mixture varies is to adapt the amount of asphaltum or cementing material to the climate and traffic where laid and to the size and quality of the sand used.

8. We can not comment upon the spirit of another's statement, because we might do harm, or, at least, not help any one by so doing.

GUTTER COVERS AT STREET CORNERS.

Please indicate your preference for wood, iron or stone gutter covers or aprons at street corners.

Road Commissioner, Lambertville, Ohio.

The best practice indicates that no covers or aprons should be used anywhere within a city. They should be avoided, where possible, in towns and villages, although some times necessary where no sewers exist. Observation shows that but very few are needed where many now exist. Necessity is a local question and permits of no general plan; nor can the matter of material, wood, iron or stone, be decided upon. In large cities no such device should be permitted. Gutter covers or aprons are an obstruction to vehicles. Their use is bad upon a portion of the roadway, especially at corners, where vehicles need the most room. Cleanliness, health and handsome finished streets militate against covers. Use curbs from five to eight inches high, thus low enough to permit crossing a street, not only at corners, but anywhere.

ELECTRIC TROLLEY CARS ON COUNTRY ROADS.

Under what regulations do trolley and other electric cars come when used on country roads? Are they under laws for road vehicles, such as carriages and wagons, or railroad laws?

J. S. Peterson, Passaic, N. J.

The rapidity with which electric lines have spread over suburban and county roads has been such that legislation has not kept pace with their construction. Special laws are slowly being passed everywhere. The tendency is towards classifying electric lines with steam railroads. This seems just, because of their speed, carrying capacity

and danger. Most lines are at present under the same rules and responsible to the same boards of county commissioners as have charge of wagon roads. This is because most electric railways are laid upon a portion of the highways.

STOPPING PLACES FOR STREET CARS.

Should street cars have definite halting places? *J. L. S., Reading, Pa.*

Yes, first crossing of short blocks and at one or more places in long blocks.

Such fixed haulting places should be marked by some simple sign as "street car stops," or "stopping place of electric car," or other suitable way. This is the universal practice in Europe, and is rapidly extending in American cities.

CIVIL SERVICE FOR EMPLOYES IN MUNICIPAL ENGINEERING.

Should the employes of a city engineer's office be included under civil service rules? *W. P. Manderson, Savannah, Ga.*

All employes who do engineering work under a city engineer or in the engineering department of a city, accomplish better and more work if they obtain their positions after passing certain practical and theoretical examinations embracing the practice and principles of the technical work which they will be called upon to perform.

They are not harassed by the doubt and worry natural to men who hold their positions through political friendship or who fear that work will be assigned them with which they are not familiar. There is too much deception and "humbug" engineering done in every city engineer's office where politics are a large factor in the appointment and retention of the employes.

Earnest study is constantly needed in an engineer's life and work. He can not properly apply his energies to his work if he is distracted by politics.

Even the temporary inspectors of sewers, paving and other work should pass a certain examination to insure a city against loss, poor and even dangerous results.

All statesmen and most politicians have so many applications for positions that they are glad to be able to answer, "put in your application for a civil service examination." Civil service examinations are not feared by self-respecting candidates, the kind needed by a city.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

LIABILITY OF A CITY FOR SEWER CONNECTIONS.

I want to know the liability generally of a city when sewer connections are made from the main sewer to various houses. If a stoppage occurs in the main and water backs into cellars and city removes stoppage at once, is city liable for damages or does owner have to take precautions, such as back trapping, himself? *W. L. Glazier, Newport, Ky.*

A general answer can not be given to the question. Each case must be decided upon its own merits. The general trend of court decisions has been that cities are not liable for mistakes of judgment of their officials if proper steps are taken to correct those errors as soon as they are discovered. A sewer of bad design or defective construction may run for a long time before any damage will result from it. A sewer of good design and first-class construction may have the bad luck to have a stoppage. The courts have had the tendency to place the two classes together and relieve the city from liability. Of late, however, there is a stronger tendency towards de-

manding of cities that they use due diligence in obtaining proper expert assistance in the design and construction of public works and holding the city responsible if it has not fulfilled its duty in this regard. See "Rainfall and Municipal Responsibility," on page 182 of the September number of MUNICIPAL ENGINEERING. An accident or an unauthorized person may place an obstruction in a sewer and the city will not be liable until it has had notice of the obstruction; but the city is liable for injuries caused by an obstruction placed in the sewer by the city engineer or of which he had actual or constructive notice. (Sup. Ct. Utah.)

The Appellate Court of Indiana decides that municipal corporations are liable for the results of their *negligence only*, and not for defective judgment in adopting defective plans, and negligence will not be inferred from the fact that culverts are defective in plan and become obstructed, and the Texas courts make the city liable for negligence in allowing a culvert to become stopped up.

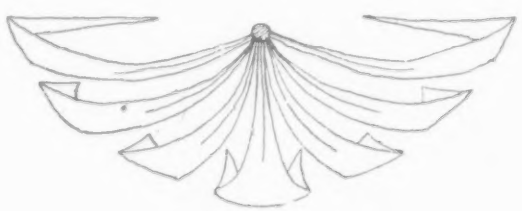
The Supreme Court of Minnesota, calling attention to the late tendency in this direction, declares the city liable if, as originally planned and constructed, a sewer is found to result in direct and physical injury to property, which is liable to be repeated, but is remediable by a change of plan, or the adoption of prudent measure, after notice and omission to use ordinary care to remedy the toil, laying it down as a general principle, that in all cases where water or sewage is thrown on property to its damage, that would not otherwise have flowed there, the corporation constructing the drain or sewer is liable.

In California, under the law, the superintendent of streets is liable on his bond if a sewer is not properly constructed, while in New York, the payment for sewer and collection of assessments must proceed on legal acceptance of the work by the engineer, even if the sewer is defective, unless fraudulent practice can be shown.

THICKNESS OF RESERVOIR WALLS.

What should be the thickness of the walls of a reservoir to contain 10 feet depth of water, the walls to be of stone laid in cement, and to stand on solid rock foundation? Size of reservoir, 100 feet by 75 feet. *D. R. G., Quincy, Ill.*

The ordinary rule, if the wall is vertical, is that the thickness shall be two-thirds the height. If the water is still, the thickness may be less, and if the best of masonry work is done and water-tight connection is made with the rock foundation, the thickness may be a foot less than the 6 feet and 7 inches given by the rule for this case. The reservoir in this case will probably be subject to ice pressure on the surface of the water, and the walls should therefore not be less than the larger dimensions given.



BY WAY OF COMMENT.

Cutting Into Improved Streets. The St. Louis *Republic* complains of the manner in which new streets are torn up by the street car companies and the gas company, and alleges that any contractor can get a permit to tear up a street pavement which cost thousands of dollars. It calls on the voters to register an effective protest at the polls against the officials responsible for it. The principal difficulty in the way of making this is that the responsible officials have many of them held their last offices on this earth, and are beyond the reach of protests of any kind. The original charters of the gas, water and street car companies, and in some cases of the electric light companies, were made when paved streets of value were not to be found, and insufficient provision was made for proper control of the operations of the companies in the streets. Sometimes there is practically no control, and in most cases the city officials must obtain what is absolutely needed under modern conditions, rather from the consideration by the corporations of their interests in preventing adverse criticism, than from an exercise of any power to enforce regulations for replacement of injured pavements, contained in the ordinances granting the charters. Modern charters are more apt to take this matter into consideration and to make proper provision for municipal control of work done on public thoroughfares. Persons or corporations not having charter rights can be controlled, and St. Louis is provided with ordinances which place in competent hands the granting of permits for cutting into the streets and for properly replacing the cuts. That city is fortunate in owning its own water system, so that the laying of water pipes is entirely under the city's control.

Water Filtration at Elmira. The city of Elmira has heretofore derived its water supply from filter galleries along the Chemung river and from the river itself. The consumption of water by the city has for some years been greater than the gallery could supply, and the proportion derived from the river has steadily increased. The water has been pumped to a large reservoir, but there has been much complaint of its condition, especially as to suspended matter and as to color. The water company has been considering filtration for some time, and has finally decided that mechanical filtration is the best for their circumstances and has just closed a contract for a Jewell filter plant consisting of eighteen filters, each 13 feet 6 inches in diameter by 14 feet high, with a capacity of 500,000 gallons each, or a total capacity of 9,000,000 gallons a day. As the present consumption is not far from 3,000,000 gallons a day the filters will not be worked at more than one-third their capacity. Additional filters can be added

as needed. The principal trouble with the advocates of mechanical filtration has been that they attributed too high a rate of flow to their apparatus, and the plants have often produced disappointment in one way or another on this account. The factor of safety in this case would seem to be well chosen. Some sedimentation takes place in the reservoir and also in the bottom chamber of the filter to which the water is first admitted, on receiving the amount of sulphate of alumina found by experiment to be necessary to produce the best result. This chemical produces a coagulation of the suspended matters. The water passes from this bottom chamber of the apparatus through a chamber filled with sand. The coagulated matter forms a filtering screen on the surface of the sand, and the filtered water is collected from the sand layer through bronze screens into pipes which lead it to the filtered water reservoir. When the difference in pressure between the two sides of the filter amounts to four pounds the filter is cleaned by shutting off the supply and reversing the current, thus washing the filter with filtered water. The washing is aided by rakes which stir up the sand and enable the water to wash out the impurities in it. Provision is made for admitting steam to the filters and thus effectually sterilizing them whenever this is desirable. The actual and comparative results of the various mechanical filters so thoroughly tested at Louisville for nearly a year are awaited with much interest.

Faulty Sewer Work in Brooklyn.

Advantage has been taken of the fact that the large new Broadway sewer through Astoria in Long Island City has settled in some sections, thus interrupting the flow of water to some extent, and causing many brick in one section to fall into the sewer, to make strong charges against the former general improvement commission and its engineer. The noted P. J. Gleason, mayor for several years, was displaced by Mayor Sanford, whose term expired December 31, 1895, but the political machine was strong and Mr. Gleason was again elected mayor, his present term beginning January 1, 1896. Those familiar with Mr. Gleason's methods will not be surprised at his taking this way of throwing discredit upon the administration which displaced him for a time, and making capital for his own administration. Doubtless there are defects in the sewers complained of, some of which would not have appeared if sufficient care had been taken and money spent to put in adequate foundations through the extremely difficult ground passed through by a portion of the sewer, but such wholesale condemnations of men and motives as well as of construction give ground for the suspicion that the public welfare and the securing of good work are not the only objects in view. Much of the sewer is below the level of

high tide and the gradient of all is very flat, from the necessities of the location, but much is made of the fact that deposits of mud are found on the bottom, although no flushing of the sewer has been done since it was constructed. Other minor defects are emphasized as of great importance, and an increase in cost over the preliminary estimates of the engineer, which did not include difficult foundations and hidden obstructions, is made the occasion for charges that there was collusion between the engineer, the inspectors, the board and the contractor, all of which, coming from Mr. Gleason's adherents, may be received with reservation of judgment until the facts are brought out before an impartial tribunal.

Asphalt for Shop Floors.

For the sake of cleanliness and to obviate the necessity of the frequent repairs necessary for wooden floors in shops, other materials are frequently tried. Concrete makes an excellent floor in appearance and in durability and can be readily laid in the best form to produce perfect drainage. The effect upon workmen is, however, injurious, for the reason that the material is a better conductor of heat than wood is, and therefore draws too much heat in cold weather from the feet of the workmen, and makes them unnecessarily uncomfortable. Concrete is also hard and unyielding and is injurious to the feet on this account. Manufacturers who have put concrete floors into their shops have shortly noticed these effects and have been obliged to cover the floors with boards or to put in planks on supports for the men to stand on at their work, raising the machines the necessary amount to enable this to be done. The loose planks or the stands are rather unsightly and much in the way in moving about and in cleaning up. Asphalt properly mixed to give a smooth and springy surface would seem to be the ideal floor. It is almost, if not quite, as good in appearance as concrete, can be readily laid in any desired form to permit of perfect drainage and facility in cleaning up; can be made as elastic as desired, and becomes more satisfactory to stand upon than wood; and is a poor conductor of heat, so that it will make it quite as warm a floor as wood. The mixture should not be as stiff as that for street purposes, as the wear is not so great and the variations in temperature are less. Where there is much oil dripping from machines, special pains should be taken to catch the oil, or the floor directly under the machine should be of concrete or other material so arranged as to drain the oil away from the asphalt.

Plumbing Regulations and Inspectors.

The board of directors of the street and sewer department of Wilmington, Del., have the regulating of plumbing in their jurisdiction, and have an excellent set of rules and regulations regarding plumbing and drain laying which cover nearly all the points necessary, and are accord-

ing to the best practice. The resolution embodying them would be an excellent model for a plumbing ordinance in any city. The only points neglected or not completely covered are the following: section 2 provides that no person shall be eligible for the office of plumbing inspector, unless he is a citizen of Wilmington, and a practical plumber of five years' experience. Section 3 provides for application of plumbers or drain layers for license to do work, and that the board of directors of the street and sewer department may grant the license if they are satisfied of the skill and responsibility of the applicants to carry on the business as applied for. No method of determining the skill of the applicants is provided. The stated restriction of eligibility for the position of plumbing inspector cuts out the men who are best qualified by education to become good plumbing inspectors, and restricts the appointment to plumbers who are not making a success at their business. It is evident that the chances are against securing the best or even fairly good inspectors under these restrictions. An examination of applicants for license as plumbers, made by a competent board, of which the engineer in charge of sewers should be a prominent member, would cut off many men who are simply journeymen plumbers, and have no knowledge of the principles lying at the foundation of their work. A candidate for plumbing inspector should be able to pass this examination, and if able to do so, a student of sanitary engineering, even if not a practicing plumber, will make a better inspector than most plumbers would. He should be under the direction and supervision of the engineer of sewers or city engineer in any event. No provision is made for records of sewer connections. Section 27 provides that no excavation shall be made in the street without a permit. Section 36 provides for refilling the opening, and section 37 provides the manner of doing the work if the plumber fails in his duty. Adequate provision is not made for the replacing of permanently improved streets, especially asphalt and others on a concrete base. Perhaps the only way to get this work properly done is for the city to do the work or to let it by contract to a responsible party whose duty it shall be to replace all cuts at a fixed price per unit of area or volume, and who shall be responsible for all repairs necessary for a reasonable length of time after the cut is replaced. The plumber is not usually a man of experience in laying concrete, and he must get the asphalt company to put in the patch of wearing surface in any event, while he is responsible for the whole. The advantage to the city of having one responsible contractor rather than dozens of plumbers is considerable.

Sewer Construction by Day's Labor. The engineer in charge of sewers in Wilmington, Del., Mr. T. Chalkley Hatton, makes a very interesting report of the op-

erations of his department in 1895 to the board of directors of the street and sewer department, in which he describes in detail the work done. A number of sewers have been constructed, costing, altogether, $77,775.79. The most important, the reconstruction of a part of the Shipley Run sewer, at and below its junction with the Norris Run sewer, is illustrated to show the difficulties of the work. On account of the restrictions of the locality the main sewer is 7 feet 4 inches high by 11 feet wide, with an overflow sewer alongside of it about 6 feet 5 inches by 6 feet. Both have vertical stone walls, with arches and inverts of brick, the inverts being set in concrete. The outlet was built in 1894, at a cost of $18,873, and the portion described, in 1895, at a cost of $12,334. A very heavy rain since the construction was completed demonstrates the efficacy of the sewer, which has formerly been a constant source of damage by overflow. This sewer, as well as over fifty others, costing in all $29,353, and being 11,582 feet long, were constructed by day's labor, the city purchasing all materials and supervising the construction. A detailed statement is given of the cost of each item of materials used in each sewer, the cost of labor, engineering and superintendence, showing careful bookkeeping and close attention to details. Eight sewers, 11,033 feet long, were built by contract at a cost of $48,422. Detailed statements of the bids are given. Comparison of the two statements shows that the city does the work on pipe sewers for 30 per cent. less than it is done by contract, although the city employs American labor living in Wilmington at $1.50 a day for men and $2.50 for horse and cart, while the contractor employs 50 per cent. Italian or other foreign labor at $1.25 a day for men and $2.25 a day for horse and cart. Some items are 18-inch pipe at $1.51, a saving of 30 cents a foot; 12-inch pipe at 68 cents, a saving of 31 cents; man-holes at $41.78, a saving of $8.96. Only one item, that of Y-branches, cost more by the city force. The total saving on the pipe sewers built during the year was $4,071.66. Excellent summaries are given, results of cement tests, and recommendations as to future work which seem to be well considered and to the point. While some parts of the report might be better arranged, especially from a typographical point of view, the plan of the report in regard to the amount and nature of information furnished may well be taken as a good example of what engineers' reports should contain.

As noted, Wilmington, Del., saved money by building sewers by day's labor. The city of Binghamton, N. Y., has been doing the same. Seven sewers were built by day's work in 1895–96, aggregating a length of 2,536 feet of 8-inch pipe, 619 feet of 10-inch pipe, 1406 feet of 12-inch pipe, 270 feet of 15-inch pipe, or a total of 4,831 feet, with 15 catch basins, 10 man-holes and 6 flush tanks. The contract price

of the sewers, probably obtained from bids on other sewers of the same class, is $7,117.20, to which is added $345.40 for inspection and $17.20 for increase in cost of pipe on one sewer, making the total probable cost to the property owners if let by contract $7,479.80. The sewers were actually built by day's labor $6,477.70, or deducting $65.38 for tools left on hand, $6,412.32. The saving to the property owners was thus $1,067.48 or over fourteen per cent. The city paid $1.50 a day for labor while the contractors pay $1.10. If the labor had been paid for at contractors' prices and had been equally efficient, there would have been an additional saving of $690.49, or a total saving of $1,757.97. This would be a saving of twenty-two per cent. on the contract price. There is the same practice here as in Wilmington of preferring to pay a higher price for home labor than foreign labor can be secured for, which practice is based on the general feeling that public work should be given to the residents of the city. This principle is not bad so long as there is competent home labor to employ, but when it is carried to the extent that is sometimes the case in the higher places, and an incompetent man is employed in a responsible position because he is the best home product, when fully competent men can be easily secured elsewhere, the inherent weakness of the theory for application to all cases is evident.

Full details of the work are not given, but can doubtless be obtained of the city engineer if desired. His report to July 1, 1896, from which the above is taken, is very short, but puts the information desired in such reports in good shape for use. The total amount of work done within the year of the report seems to amount to $23,730.57, being all sewer work. The expense of the engineer's office was $7,573.76, or 31.9 per cent. of the work supervised. While this per cent. seems high, the routine work demands a certain force, and the comparatively small amount of work done required no more, except superintendents of the sewer work, who took the place of inspectors. The saving in cost of sewers supervised by the department was several times the estimated cost of inspection.

Brooklyn's Water Supply. The water supply of the city of Brooklyn is derived from numerous small streams on the southern slope of Long Island and from several groups of wells driven to the inexhaustible underground supply underlying the island. The quality of the supply has never been seriously questioned, but the rapid growth of the city has made the question of quantity one of much importance. One addition is scarcely completed when another is called for. Late in August much complaint was made by consumers of the fishy taste and odor in the water, which was accompanied by that of sulphuretted hydrogen. The complaints were

numerous and loud, as the condition of the water was very disagreeable to many persons. Flushing of the mains made a slight improvement. The board of health has from time to time made examinations of the water supply, and consider that there is nothing in the present condition that is dangerous to life or health. The department of city works, through the engineer of the water supply, states the great desirability of constant study of the water supply so that the cause of such troubles as the present can be determined and removed or prevented from occurring. It professes ignorance of the exact reason for the present trouble, and the engineer thinks it necessary to enter into an investigation to ascertain whether the trouble exists in the supply or the distribution, whether it is local or general, what is its character and what its remedy. Deputy Water Purveyor Dicker considers that the present condition is due to the decay of vegetation in the reservoirs, and that there is nothing unwholesome about it; also, that it will soon improve.

The health commissioner has reported that the warm weather of early spring, followed by the rains in July, induced a heavy vegetable growth in these waters, which was in large part killed by the extremely warm weather of early August. This decaying matter, with the organisms that feed upon it, have caused the objectionable taste and odor. He considers that the water is perfectly safe for use at present, and compares favorably with that furnished other large cities. He recommends that the ponds be cleaned of the dead vegetable matter, the distributing reservoirs cleaned and the mains flushed; also that a laboratory for the study of the water and the methods of treatment of it be established, with an auxiliary laboratory on the watershed from which the supply is derived.

The agitation for a continuous study of the quality of the supply should bear fruit in the appropriation of a sufficient sum to make it possible to keep close watch of the condition of the water and to determine the causes of the troubles which arise and the best methods of preventing or removing them. Money thus spent is well spent, as it conduces more to the comfort of the people than an equal amount spent in any other possible way. The present discussion has brought out again many of the propositions for obtaining supplies for the greater New York and other cities of the Hudson River valley from distant sources. One suggested is to pump the necessary amount from Lake Ontario up to the elevation of the city of Rome, when it could flow by gravity to New York city, each city on the line pumping its supply from the conduit or canal into its system of distribution pipes. The enormous cost of conduit and of pumping and the doubtful purity of the water of Lake Ontario at some sea-

sons are points which must be well considered in connection with such a scheme.

Repaving in Omaha.

The city of Omaha is the location of the Trans-Mississippi Exposition, to be held in 1898. Congress has appropriated $200,000 for a government building and exhibit, provided $250,000 is raised in other ways. The city of Omaha has already subscribed to $300,000 of stock in the enterprise, and much more is in sight from subscriptions and from appropriations by cities and states for exhibits and buildings. The exposition is therefore an assured fact.

Omaha was taken with the craze for cheap pavements six or eight years ago, and put down many miles of wooden block pavement, much of it on concrete foundation. The timber used was white cedar and cypress. A large proportion of the wood was not the best of its kind, and the cypress especially was soft and spongy. Some of the authorities were misled as to the durability of such timber by not being well enough informed as to varieties of wood and by inspecting streets of creosoted blocks without sufficient knowledge of the effects of that process. As a consequence, nearly all the wooden block streets are in a state of greater or less dilapidation, and many, especially of the cypress block, have a layer of dust and splinters, with enough blocks remaining partially solid to render the streets practically impassable. The approach of the Exposition makes it absolutely necessary to replace some of these streets, and the wish for a good appearance makes it desirable to put them all in as good condition as possible.

The question now is as to the best method of making the improvements. Under the charter it is impossible to repair a street except on petition of the owners of a majority of the property to be affected, and the property owners also have the right to select the material if they so desire. In the present condition of finances the property owners can not be depended upon to do their part in inaugurating the improvements, especially as many of them are non-resident.

A park commissioner, who has had considerable experience with black earth and cinders in proper proportions on the light traveled park drives, is strongly advocating the covering of the old wooden pavements with this material, while a member of the board of public works who has recently had a very unfavorable experience with a similar mixture on a well traveled street with a gradient of six to eight per cent. is as strongly opposed to the project, the proposition being that the city pay the entire bill. It is claimed that the cost will not be more than 35 cents a square yard, or from $1.40 to $1.75 a lineal foot of street. But, if, as experience has shown on the street mentioned, the work must be done over after two or three heavy rains, or once in three or four months on account

of wear, it is easy to see that the process will not be economical if it is cheap.

The only other way out of the dilemma, since the city is financially unable to replace the pavements with durable material, is to secure such modification of the charter as will permit the pavements to be laid without petition from property owners. A move will be made in this direction at the legislature this winter.

All public improvements are now under the control of the city council, the board of public works acting as executive officers to carry out the ordinances of the council. In a special case, such as the present, where the necessity of repaving is so obvious and has such a particular reason, the council may, perhaps, be depended upon to set the work going if it is given the power, but a city council is likely to be but little better than the property owners in getting started on an improvement, and is not very likely to proceed upon any well defined system. A competent board of public works, with the city engineer as a member, is demonstrated by experience to be the best authority to which to intrust the formation of a general system, and the beginning of the proceedings for a specific improvement. The council should have the power to approve or disapprove of a particular improvement, without the power of modification, as in St. Louis, or, better yet, perhaps, should have the power, with the concurrence of the board of public works, to formulate a plan for the improvements to be carried through during the year, and the board of public works then be intrusted with the construction of the work without further reference to the council, as in Milwaukee. The property owners themselves should have some opportunity to be heard, and in cases of special hardship the right to effectually remonstrate would not be wrongly exercised. This right may well be limited to the resident property owners, since they are the people most intimately interested in the welfare of the street. This provision works well in Indianapolis, where a majority of the property owners resident on the street can stop an improvement, counting number of owners and not amount of property.

CURRENT INFORMATION.

MEETING OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

The coming meeting of the American Society of Municipal Improvements, in Chicago, Oct. 14-16, promises to be interesting and instructive. A feature of the meeting will be the reports of the several committees on various branches of city government. Discussions upon some of these reports are likely to be very interesting. Papers are also promised on numerous subjects connected with municipal improvements. It is estimated that over four hundred municipal officers and persons directly interested in their work will be present.

The local committee of arrangements is composed of Gen. Charles Fitz Simons, chairman; George B. Swift, B. A. Eckhart, Ferdinand W. Peck, W. H. Alsip, Joseph Downey, John Powers, Louis B. Jackson and John C. Spry. President Benzenberg, in a letter to Municipal Engineering, under date of Sept. 23, states that the arrangements are still somewhat indefinite, owing to delay in taking up the work, but he furnishes the following information:

The headquarters will be established at the Great Northern hotel, and it is expected to be the stopping place for most of the members. The hotel is run upon the European plan and rooms will be only $1.50 to $3 per day, according to location. The meetings of the convention will be held in the hall at Kinsley's, on Adams-st., one and one-half blocks from the hotel. The committee on arrangements has outlined a trip on the lake to the four-

G. H. Benzenberg,
President.

Aug. Herrmann,
First Vice-President.

W. R. Kerr,
Second Vice-President.

James E. McGann,
Third Vice-President.

David L. Fulton,
Secretary.

John L. Kennedy,
Treasurer.

OFFICERS OF AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

mile water works crib, thence to Jackson park, thence by Columbian coaches to Washington park, where lunch will be served, and thence a drive back to the city; also a trip by rail to the drainage canal and a banquet likely on Friday evening.

The first session of the society will be at 10 a. m. Oct. 14, opening with a business meeting, reports of officers and committees. A meeting will be had on that afternoon and possibly that evening and on the following forenoon and afternoon, and Friday forenoon, and an evening meeting on Thursday, if the work requires it. There will be nothing on the program interfering with evening meetings, excepting on Friday, and one of the trips will have to be postponed for Saturday.

I have today made application to the six various trunk line passenger associations for reduced fare, and feel quite safe in saying that we will receive favorable answers toward one and one-third fare. * * *

We shall have upward of fifteen papers, aside from committee reports, and shall not be surprised to have twenty to twenty-five.

Regretting I cannot give you a more definite program at the present time, I remain, G. H. BENZENBERG, President.

The present officers of the association are: President, G. H. Benzenberg, Milwaukee, Wis.; Vice-Presidents, August Herrmann, Cincinnati; W. R. Kerr, Chicago; James E. McGann, New Haven; Secretary, David L. Fulton, Allegheny, Pa.; Treasurer, John L. Kennedy, Nashville.

The committees in charge of the various branches of work of the association are as follows:

Street Paving—A. D. Thompson, Peoria, Ill.; Nelson P. Lewis, Brooklyn, N. Y.; S. J. Hathaway, Marietta, O.

Electric Lighting—J. A. Cabot, Cincinnati; Harold P. Brown, Newark, N. J.; F. W. Cappellen, Minneapolis, Minn.

Sewers—R. E. McMath, St. Louis; G. L. Clausen, Newark; George N. Fernald, Portland, Me.

Water Works—H. Van Duyne, Newark; E. H. Keating, Toronto; S. J. Hathaway, New Bedford, Mass.

Tax Assessment—G. F. Munro, Omaha, Neb.; Thomas De Vilbliss, Ft. Wayne, Ind.; Charles P. Sayres.

City Government and Legislation—Charles Carroll Brown, Indianapolis; J. M. McConkey, Harrisburg, Pa.

Garbage and Street Cleaning—J. S. O'Shea, Buffalo; Lyman H. Johnson, New Haven; Dr. Pendergast, Cincinnati.

Finance Committee—L. W. Rundlett, St. Paul, Minn.; F. J. O'Brien, Oswego, N. Y.; W. H. Glover, Covington, Ky.

Much work has been done by the committees, and the presentation of the results will make the meeting, it is expected, one of much importance.

THE STREET CLEANING MOVEMENT IN BOSTON.

The street department of Boston, Mass., contemplates co-operating with the police department in an attempt to control the throwing of unnecessary rubbish about the streets, the practice of which is, in a large measure, responsible for the bad condition of that city's thoroughfares. It is estimated that nearly half of the money annually spent by the street-cleaning department is caused by the removing of waste paper, fruit peels, straw and excelsior from packing cases, droppings from over-filled carts and many other kinds of rubbish which finds its way into the streets through the carelessness of people who should take care of it, and in direct violation of the statutes. Sections of chapter 43 of the revised ordinances have been printed in English, Hebrew and Italian and have been extensively circulated in those sections of the city where most of the dirt is thrown into the streets. Heretofore this practice has proven of little avail, and it is thought that to bring them a little more forcibly to the people's notice by making arrests and bringing the cases into court will prove effectual.

The work of the Boston Cleaning League, an organization started by a number of people interested in the charitable institutions of the city, toward influencing public opinion in the same direction, is in direct line with the movement proposed by the street cleaning department. The work of the members of the league consists in influencing those with whom they may come in contact in their work, and through them and others, toward having clean streets by keeping the streets from becoming dirty. The street cleaning brigade of Mr. S. F. Hubbard, a member of the league, which was started last summer, has accomplished a good deal, and it is hoped that other brigades of a similar kind will be started in other parts of the city during this winter. The boys are divided into gangs, with a foreman at the head of each gang, and are supplied with badges by the street department, which are somewhat similar to those used by the Institute Cleaning League of New York.

Around the edge of the badge is a raised collar bearing the words, "Our Aim—A Beautiful City," and on the plate inside of the collar is "Boston Street Cleaning League." It has been found difficult to

keep the boys interested, yet something has been accomplished. The Street Cleaning League does not intend to stop with the organization of these brigades, but will zealously try to influence and mold public opinion, and to bring home to people in every way the meaning of their carelessness with regard to throwing things in the streets.

REGULATION OF CUTTING INTO STREET PAVEMENTS.

A question which is receiving deserved attention in Brooklyn, N. Y., is that of tearing up newly-laid asphalt pavements for the purpose of reaching subway pipes and wires. A great deal of time is being devoted to the matter by N. P. Lewis, engineer of street construction and maintenance, who has drafted a new set of rules relative to opening pavements, and which he hopes will go into effect Oct. 1. To obviate one of the defects of tearing up and relaying a new pavement, that of the repaired part settling or sinking, Mr. Lewis will provide that in addition to refilling the hole and hammering down the earth, eight inches of Portland cement concrete must be laid beneath the upper paving. Mr. Lewis believes that this will make so strong a crossing that even if the earth beneath settles the concrete will sustain the pavement. He also thinks that it will be a benefit to the city to have all this repairing of torn up places done by one contractor instead of by a large number of contractors at varying prices as is done at present. It is uncertain, however, whether the work will be made a matter of competition, or whether the commissioner will select a contractor whom he knows to be in a position to look after it. The charge at present for a permit to open a pavement is $7 for a water or gas pipe, if no more than four yards of pavement is torn up. For sewer connections a charge of $10 is made for an opening, and in either case the city retains a dollar and pays to the contractor who does the work the rest of the money. Contractors who lay pavement for the city agree to keep such pavement in repair for five years, and if, in that time, an opening by permit is made, it has been the practice to give to the guaranteeing contractor the work of relaying the pavement over an opening.

The power of the City Works Commissioner in making rules regarding work of this kind was increased by the legislature of 1896 by passing a law known as Chapter 825. This law makes it unlawful for any corporation or person to open any pavement without a permit from the Commissioner of City Works, and empowers the Commissioner to make reasonable rules governing the issue of permits and charging for the cost of inspection of any sort of repairing made necessary by such permit. An ordinance was passed by the Board of Aldermen Oct. 21, 1895, which prohibits the granting of permits for tearing up asphalt pavements within five years of its laying, or stone paving within three years, except in cases of extreme necessity. The Department of City Works is also compelled to give subway companies interested fifteen days' notice of any paving or repairing, so that each corporation may have an opportunity then to do any repairing to their pipes or wires that may be needed.

Engineer Lewis says that "notwithstanding this ordinance there are many cases in which the department is absolutely powerless to prevent the tearing up of a pavement. When a man builds a new house he has a right which cannot be abridged to get a connection with gas and water mains, and with the sewer. I am convinced that if in a case of that kind we refused to grant a permit a mandamus would stand to compel us to do so. This applies likewise to a bad leak that may be sprung in a gas or water main. Formerly it was the custom of corporations to first tear up the pavement and then kindly let this department know about it. Commissioner White compelled the companies first to get a permit from me, and even then they were not permitted to proceed with the work until the consent of the contractor who had guaranteed the pavement was secured. I am set on abolishing abuses in the tearing up of pavements, and have given the matter considerable attention. But it cannot be prevented altogether."

Under the new specifications the charges for a permit for opening will be, Mr. Lewis thinks, in the neighborhood of the charges made in Philadelphia and New York. In Philadelphia the charges for a permit for an opening in an asphalt pavement is $13, and this is increased to $18 between Dec. 1 and March 1 of each year. In New York the charge is $4 a yard for asphalt, but the city never estimates on less than four yards, so that the amount for each permit is at least $16. A charge of $8 will be made for the first yard of granite paving and $4 for each additional yard.

SANITATION IN ILLINOIS.

A partial report has been submitted by the committee appointed to formulate a bill regulating the sanitary conditions of the state of Illinois. The bill provides that the State Board of Health shall make a comprehensive study of sanitation, have entire supervision over all public supplies of potable waters and their sources, the development and utilization of underground sources, and imposes penalties for the contamination of water supplies. Analyses of water are to be made at the Illinois University, at Champaign. The State Board of Health is also charged with methods and means of collection and disposal of sewage, and all sewerage systems will be subject to its approval.

NEED OF A SEWER FARM IN COLUMBUS, O.

In rendering an opinion in the suits to enjoin the outlet of the West Side sewer into the river at Columbus, O., Judge Evans holds against the city and refuses to dissolve the injunctions, except on certain conditions. The suits were brought by Mrs. Mary English and Mrs. Elizabeth Rader to enjoin the city from emptying any more sewage and filth into the Scioto river south of the city. Judge Evans found that in the case of the English heirs, the plaintiffs have, since the injunction was allowed, sold the real estate described in the petition to the city, and, the city being the owner of the farm and having the right to use its own farm as it pleases, no sufficient reason is shown why the injunction in that case should be continued. In the suit brought by Mrs. Rader, to enjoin the emptying of the West Side sewer into the river at a point opposite where the intercepting sewer discharges, the decision rendered will necessitate the sewerage system lying idle until the city devises some other plan of disposing of the sewage than by placing it in the river. By this decision the city authorities are forced to carry out their original plans of establishing and maintaining a sewer farm.

PARK REGULATIONS.

It was recently decided by the Board of Park Commissioners, Rochester, N. Y., that the ordinances relating to the parks were too cumbersome and that they could be revised. E. R. Foreman, second assistant corporation counsel, who was engaged to make the revision, has finished the work, and the report submitted by him has been adopted, with some modifications suggested by the experience of the members of the committee. The ordinance prohibits the following in any of the parks:

1 Commit any disorderly or immoral acts.
2. Be intoxicated.
3. Throw stones or missiles.
4. Utter loud or indecent language.
5. Play any game of cards or chance.
6. Tell fortunes.
7. Beg.
8. Publicly solicit subscriptions.
9. Violate the regulations of said board relating to any building.
10. Drive or lead a horse not well broken.
11. Allow any dog to run at large.
12. Throw offensive substances into any park waters.
13. Injure or unnecessarily disturb any fish, water fowl, birds or animals.
14. Injure any notice posted by order of said board.
15. Bathe in park waters without having the body concealed by suitable covering extending from the knees to the shoulders.

The consent of the Park Board must be obtained for the following:

1. In any manner injure any tree, plant, flower, fruit, turf or structure.
2. Keep or offer anything for sale.
3. Play any music.
4. Post or display any sign, banner or advertisement.
5. Deliver any public speech.
6. Solicit passengers for any boat or vehicles for hire.
7. Obstruct in any way a roadway or path.
8. Discharge any firearm or fireworks or send up any balloons.
9. Permit any animal except horses and dogs to enter said parks.
10. Ride or drive any animal or vehicle at a speed exceeding eight miles per hour. This shall not apply to the vehicles of the fire or police departments, ambulances, nor vehicles used by physicians when actually engaged in responding to emergency calls.
11. Hold any picnic at a place not designated by said Board for that purpose.
12. Engage in any marching or driving as members of a military, political or other organization.
13. Conduct any funeral procession nor vehicle containing the body of a deceased person.
14. Build any fire.
15. Tie any horse to a tree.
16. Write, paint or carve on any tree, bench or structure.
17. Climb any tree.
18. Enter any place upon which the words "No admittance" shall be displayed.
19. Play base ball, tennis, nor any other game at a place not designated by said board for that purpose.
20. Take ice from any park waters.
21. Fish in any park waters.
22. Bathe in any place not designated by said board for that purpose.

23. Enter nor leave said parks except at the established ways of entrance and exit.

24. Place or propel any boat upon park waters.

25. Land from any boat at a place not designated by said board for that purpose.

26. Carry any flowers and shrubs, firearm, sling shot, ax, saw, shovel or spade, withing the following parks, viz.: Genesee Valley Park, Highland Park, Seneca Park east and Seneca Park west.

27. Occupy in any way the slopes of the river banks.

A TOWN ENJOINED FROM BUILDING A COMPETING WATER WORKS PLANT.

The decision rendered in the case of the Union Water Company against the borough of Rochester, Pa., the report of which was filed Sept. 15, affects many of the boroughs of Pennsylvania. The question involved is the right of a borough to construct its own water works after it has authorized a corporation to construct a plant and supply water. The case was argued during the May session of the Supreme Court and J. M. Swearingen, master in the case, who was appointed to take testimony on a number of questions in dispute, finds in favor of the plaintiff company. He says the plant of the water company is well designed and well constructed, and is simply sufficient to supply Rochester; that the water company has acted in good faith and has complied with the conditions of the contract entered into with the borough, and that the present works of the Union Water Company are superior to those the borough proposed to build; that the borough of Rochester exercised its power when it contracted with the Union Water Company, and having made its choice, it cannot now proceed to erect a plant of its own, and thus virtually destroy the existing works of the plaintiff company.

A SMELLING BEE AT AN ASPHALT PLANT.

Complaint was made by residents of Sioux City, Ia., during the construction of an asphalt plant at the foot of Jennings-st. that it would impregnate the atmosphere with an offensive odor. For the purpose of demonstrating the fallacy of these apprehensions the asphalt people invited interested people to be present at the cooking of some asphalt. The Sioux City Journal reports the results as follows:

"E. B. Demorest of the Barber Asphalt Company presided over the culinary department and H. R. Kasson of the Warren-Scharf Company waited on the table. A panful of asphalt was melted over a fire. The people were standing about five feet from the fire. Most of them could not smell the stuff at all, and some of them could catch a whiff every now and then. Mr. Kasson dipped a stick into the concoction and passed it around among the aldermen. They all declared there was nothing objectionable in the odor, and Alderman Westcott said he rather liked it. He said, 'Any one that would kick on that smell ought to move out of town.' Mr. Kasson was not satisfied with convincing the aldermen that the asphalt was not objectionable to the sense of smell, but insisted that each of them take a chew of the stuff to see how it tasted.

"City Engineer Wakefield returned home on Friday night from Omaha, where he visited the asphalt plant of the Barber company, and took a sniff of the steam arising from the cooking asphalt. He said to a reporter that the odor was not at all disagreeable and, in fact, many persons living in the vicinity of the plant were surprised when asked if they smelled any bad odor. They said they did not know there was any.

"'It has a sort of pitchy smell,' he said, 'and to me it was rather pleasant. The asphalt does not smell nearly so strong while cooking as it does when poured into the street. Then you can smell it. Why, it is a disinfectant. It was burned in the streets of Jacksonville, Fla., to kill out yellow fever, and it will be a good thing to kill out the malaria in the Floyd river bottoms.'"

SUSPENSION OF STREET PAVING IN BROOKLYN.

Street paving has been almost entirely suspended in Brooklyn, N. Y., on account of the inability of the city to pay contractors at this time. The sum of $135,000 is said to be overdue one firm. Municipal Engineering requested a statement of facts regarding the matter from Mr. N. P. Lewis, the engineer in charge of street construction and maintenance, who wrote in reply:

BROOKLYN, N. Y., Sept. 17, 1896.

To the Editor of Municipal Engineering:

In reply to yours of the 15th inst., relative to suspension of work on account of lack of funds for payment to contractors, I would say that this statement is virtually correct.

Bonds were offered for sale about the middle of July simultaneously with an offer of a large amount in New York City, but, owing to the unfavorable condition of the money market at that time, there were very few bids, and none were sold. There being no substantial improvement in the money market, it has been considered unwise to offer any more bonds until later in the year.

This prevents us from carrying out a great deal of work which has been contemplated for this year, although we have still eight asphalt contracts certified by

the Comptroller under which work is being done. In addition to this there are some sixty contracts, twenty-five with Cranford & Co., twenty-seven with the Alcatraz Co., six with the Eastern Bermudez Co. and two with the Fruin-Bambrick Construction Co., none of which have been certified by the Comptroller, and upon none of which it is probable that work can be done this year. Besides these we have several contracts for vitrified brick and half a dozen or more for granite paving which will have to lay over until next year. Respectfully,

N. P. LEWIS,
Engineer of Street Construction and Maintenance.

THE REJECTED BID FOR THE FIFTH AVENUE PAVEMENT.

Justice Smyth of the Supreme Court denied the application of Kelly & Booth for a writ of mandamus to compel the commissioner of public works of New York City to open and accept their bid for paving with asphalt Fifth avenue, between Fifth and Fifty-ninth streets. Justice Smyth holds, with the commissioner, that Kelly & Booth did not file the proper certificate and comply with the provisions advertised.

The provisions under which the contract was to be let were to the effect that if the bidder had never done work in New York City to which he could refer he would be required to file with the commissioner some time before his bid a certificate from a city where he had done work, the chief official of such city certifying to the quality of the work. Kelly & Booth filed a certificate from a Western city, but it was alleged that it was not in time and it was not accepted. Another certificate was filed later from the city of Fresno Cal., but not in time. The commissioners declined to accept the bid when filed, claiming that it had not met the requirements. The bid of Kelly & Booth was more than $80,000 lower than that of the successful bidder.

A CITY'S CLAIM AGAINST A CONTRACTOR FOR DAMAGES.

The village of Avondale, O., while maintaining a separate government, contracted with James R. Holmes to pave Main avenue, but who, for some reason, refused to proceed with the work, and the contract had to be relet. As a result of the recent annexation of Avondale to the city of Cincinnati the latter city became the injured party and sued the estate of Contractor Holmes and those who were on his bond to recover $28,000 damages alleged to have been sustained by reason of Holmes's default. In the Common Pleas Court the city recovered $22,000, but this finding was reversed by the Circuit Court, and the city has now filed the case in the Supreme Court in error to the Circuit Court of Hamilton county.

ASPHALTUM COVERING OF BRIDGES.

About a year ago the supervisors of Orange county, California, had the floor of a 1,200 foot bridge covered with asphaltum. It has been so satisfactory that they have recently had the same covering applied to other bridges to the extent of about 3,000 linear feet.

MUNICIPAL CONVENTION OF THIRD-CLASS CITIES.

A municipal convention of third-class cities was held at Williamsport, Pa., Aug. 25 and 26 to take final action on the proposed amendments to the acts governing cities of this class in Pennsylvania. One proposed change relates to assessments, according to foot front rules, for street improvements, which says that "Councils may provide for an equitable reduction, not exceeding one-third, from the frontage of lots at streets and other intersections, where from their peculiar or pointed shape an assessment for the full frontage would be inequitable." A measure to place city appointees under civil service rule was indorsed.

ASPHALT PATHS FOR BICYCLE RIDERS.

Bicycle riders in Brooklyn, N. Y., are urging the construction of an asphalt path on thoroughfares paved with brick or stone. The plan is approved by Engineer Lewis, who says in an interview regarding it: "Of course it is out of the question for anything to be done this year, but I do not see why this idea should not be favorably regarded another year. The cost is an important matter to be considered. We have had no experience with strips or ribbons of asphalt in this city, but, judging by what they have done in New York, I suppose the best place for such strips is next the curb on each side of the street. If a strip of asphalt was put down in the middle of the avenue it would be largely monopolized by vehicles, and probably the wheelmen would get less use of it than if one narrow strip were placed on each side.

"If these strips were four and a half feet wide I should estimate roughly that

for a mile the cost would be in the neighborhood of $10,000. Perhaps it would not be so much, and naturally it would not be if narrower strips were laid. The asphalt with the binder course would be three inches thick. It would be necessary to remove the granite blocks and relay them, so as to gain three inches of room for the asphalt, or else the granite blocks could be taken away for use elsewhere and a concrete foundation be put down for the asphalt. The latter course would be more costly, but then the city would have the granite blocks, instead of burying them."

FIGURING OUT THE EXACT COST OF PAVEMENTS.

The exaggerated idea that most people have of the exorbitant cost of paving a city street led D. E. Wright, director of public work, Cleveland, O., to figure out the exact cost a square foot for the paving done in that city during 1895. Brick pavements, he found, cost 13.2 cents a square foot, including everything but the interest on the bonds. Mr. Wright's figures showed that a 32-foot lot would cost $1.98 a foot front, and a 50-foot lot would cost $99, not counting the interest on the bonds; this is payable in ten payments, one payment every six months for five years will pay the entire cost of the pavement. Dressed block stone costs 35.7 cents and common stone 23.7 cents a square foot.

AN INSTANCE OF PROPER CARE OF HIGHWAYS.

A subject of much favorable comment in New Haven, Conn., is the excellent condition of the highways located both outside of the city and within the city limits, which, in comparison with the city streets, show a very marked improvement in the methods of caring for them. Much credit is reflected on Edward Harrington, roadmaster and bridge inspector, who has had full control of the work and who thoroughly understands roadmaking. When Mr. Harrington took the office he now holds he was told that it was the policy of the board of selectmen to as nearly as possible realize for the town the full benefit of the money paid from the town treasury, and to employ for the most part men competent to earn the money paid; that the old plan of allowing a large number of men to secure a few days' work on the roads at regular intervals was abandoned, and men employed who were capable and willing to perform a reasonable service during a day. Assured that his action would be indorsed by the board, Mr. Harrington insisted that men who were sent to aid him in his work should perform a fair day's service. Serious objections were taken by quite a number of the men to the change in methods, but they were told that unless they saw fit to render reasonable service for the money received they could seek employment elsewhere. This resulted in securing men for assistants who were willing to work and who worked as directed, with the result that the roads began to show a great improvement, and to be a constant source of satisfaction to the tax-payers. The streets are carefully watched by Roadmaster Harrington, and when slight repairs are necessary they are made, thus keeping the roads in excellent condition with but slight expense after they have once been hardened and put into good, first-class shape. All of the roads have been hardened and crowned in a manner that gives good drainage and prevents washing in heavy rain storms; the streets are sprinkled by wagons owned by the town and operated by men employed by the town; the cost of maintaining the highways this year will be lower than in many years before, and the amount of work accomplished will exceed in value that of previous results by many thousand dollars. The system has been reduced to a business basis that gives the very best results.

LIABILITY OF PUBLIC SERVICE COMPANIES FOR DAMAGE TO PAVEMENTS.

At a meeting of the Board of Public Works, Denver, Col., Aug. 26, decisive steps were taken to secure the repairing of the asphalt paving on Sixteenth and Seventeenth streets. The facts of the case, which were set forth in resolutions, stated that the Board of Public Works had directed the Barber Asphalt Paving company and William James, contractors for the streets, to put the pavements in repair under the five-year guarantee to maintain said pavements in perfect repair, but that the contractors refused to make repairs, claiming that a considerable amount of damage had been done by leaking gas and steam mains, and claiming that they were not liable for damage caused by leaking gas and steam mains. Careful inquiry and investigation and laboratory tests proved this claim true, and on advising with the city at-

torney the board found that contracts with paving contractors do not cover damage done by the negligence of gas and steam companies, but that such companies are liable to the city, as they operate under franchise and licenses of the city. The companies are required to deposit an aggregate of $5,000 to pay for their share of the damage done, and in case the specified sums are not forthcoming, the board announces that immediate steps will be taken for the annulment of the franchises of these corporations.

TESTS OF PAVING BRICK.

The result of a test of brick which were submitted to C. W. Kelly, City Engineer at New Haven, Conn., is as follows:

For absorption one-half bricks were dried in a baker's oven for twenty-four hours, and then immersed in water for twenty-four hours.

For abrasion, two bricks of a kind were taken and they were all put in together into a tumbling barrel two feet in diameter and about three feet in length with 275 pounds of scrap iron in pieces ranging from about two to eight pounds.

Number of revolutions per minute, twenty-seven.

	Absorption	One hour in tumbling barrel	Three hours in tumbling barrel
Mack wire cut	.034	.063	.094
Mack repressed	.025	.052	.075
McMahon, Porter & Co., wire cut	.094	.074	.106
McMahon, Porter & Co., repressed	.036	.054	.106
Catskill	.034	—	.085
Syracuse, small size	.000	.040	.057
Harrington	.022	.043	.062

The loss in the case of the Syracuse bricks was almost entirely by chipping. In the case of the other brick it was mostly by a wearing of the brick and rounding of the edges.

HIGHWAY IMPROVEMENT IN MASSACHUSETTS.

A tour of inspection was made in Berkshire, Franklin, Hampden and Hampshire counties recently by President T. C. Mendenhall and other members of the Massachusetts Highway Commission. The hearings given during the trip show a widespread and general interest and a desire was shown on the part of the various towns in the counties visited to obtain more of the roads. An inspection was also made by the commission of stretches of state road completed or under construction in the territory west of Worcester county, which number twenty-one separate and distinct portions of state road, and comprise about one-third of the total extent of the state roads in the state.

NEW PUBLICATIONS.

Mayors' Message, City Controller's Report and Reports of Departments of the City of Williamsport, Pa.

The address of Mayor Mansel and of his predecessor in office, W. G. Elliott, indicate that Williamsport is favored with progressive spirited administration of its affairs. Both express gratification over the modern improvements of the town, embracing about twenty-five miles of sewers, of which ten were built last year, and about six miles of asphalt, brick, wood block and macadam pavements. Arrangements for systematic street cleaning are urged. Municipal ownership of the water and lighting plants is advised by Mayor Mansel.

George D. Snyder, City Engineer, in his report, sets forth the details of measurement and cost of work under his direction in good form. He shows that only about 7½ per cent. of the total mileage of streets have any kind of pavement, and only about 3½ per cent. are properly paved. He urges a continuance of the policy of improvement, by doing a certain amount of work each year, whether petitioned for or not. "It is false economy," he says, "to maintain dirt streets, as at present. Paving should be encouraged by maintaining the paved streets in first-class condition and by keeping them scrupulously clean, and spending as little money as possible on unpaved streets. Many of our unpaved streets could be paved to advantage by the more general use of broken stone and gravel, and a steam road roller, but it is a question as to how extensively a street could be improved in this way without being considered an original pavement by the courts, and thus preventing the city from even assessing the cost of a pavement on the abutting property-owners."

Mr. Snyder reports the results of his cement tests during the year. He says that he has been much hampered in this work, however, by inadequate force.

The relative cost of engineering and inspection of sewers and pavements was, for sewers, 7.2 per cent. of the total cost,

and for pavements, 1.7. The cost per foot on sewer construction was, for engineering, .045, and for inspection, .038; total, .083. On pavement construction the cost per square yard, for engineering, .027, and for inspection, .020; total, .048. This is very much less than the cost of this service in previous years, as in 1891 it reached 29.0 per cent., and in 1890, 42.0.

Twenty-third Annual Report of the Board of Public Works of the City of Grand Rapids, Mich., for the fiscal year ending April 30, 1896:

The more important details of the improvement work are set forth in the reports of the City Engineer, Mr. H. A. Collar. Much of the work on streets was in the reimprovement of worn out cedar block pavements, new curbing and new catch basins. Some of the paving consisted of brick on concrete, and one short street of tar concrete on cobble foundation. The sewerage system was increased over four miles. The total expenditures for pavements, sewers, bridges and water works amounted to $109,911, and the expenses of the engineering department amounted to $8,158.

Municipal Engineering Statistics of the City of Quebec:

These statistics cover areas, lengths of streets, streets improved and unimproved and distances between important parts, embracing also inventories of all city property. It gives all kinds of figures that an exacting tax-payer has a right to demand.

PERSONAL.

Mr. N. M. Brandon, City Engineer at Meridian, Miss., died Sept. 14.

Mr. Michael Crogan, Street Commissioner at Wilkesbarre, Pa., died Sept. 1.

Mr. Lewis F. Mills, Street Supervisor, Atlantic City, N. J., committed suicide Aug. 22.

Mr. Charles E. Putnam has been appointed Superintendent of Parks at Boston, Mass.

Mr. R M. Walmsley has been elected president of the Drainage Commission at New Orleans, La.

Mr. John W. Maddox has resigned his position of Superintendent of the Water Works at Austin, Tex.

Mr. John Connelly has resigned his position as Superintendent of Water Works at Columbus, Miss.

Mr. Hudson Ansley has resigned his position as President of the Water Works Company, at Salamanca, N. Y.

Mr. Max J. Becker, Past President American Society Civil Engineers, died Aug. 23 at Mackinac Island, Mich.

Mr. Herbert T. Snow has been appointed Water Superintendent to succeed Mr. George C. Parker, at Westfield, Mass.

Mr. Henry L. Cranford, president of the Cranford Paving Company, Washington, D. C., died in that city Aug. 23.

Mr. A. J. Cox has been appointed City Engineer to succeed Mr. Charles S. McGowan, who resigned at Iowa City, Ia.

Mr. James McIntosh has been appointed chairman of the newly organized board of public works, Newberry, S. C.

Mr. Augustus T. Metcalfe, Superintendent of Water Works at Canandaigua, N. Y., dropped dead in Rochester, N. Y., Sept. 11.

Mr. Nathan C. Price has been elected City Surveyor and Mr. S. C. Carton Assistant Engineer of Water Works at Cape May, N. J.

Mr. S. Stouffer has been elected president and Mr. W. A. Mobily clerk of the board of control and review at Hagerstown, Md.

Mr. E. C. Jordan, C. E., Portland, Me., delivered an address on "Good Roads" at Rigby Park during the New England State Fair.

Mr. L. U. Colbath has succeeded as chairman of the Board of Public Works, Salt Lake City, Utah, Mr. A. F. Doremus, who resigned.

Mr. Michael J. Carroll has been elected chief inspector for the new sewer division at Boston, Mass., to succeed Mr. John J. Arthur.

Mr. E. G. Harrison has been appointed Engineer of Roads in the Road Inquiry Bureau of the Agricultural Department by Secretary Morton.

Mr. Matthew Addy, President of the Addyston Pipe and Steel Company, Cincinnati, O., died recently in Falmouth, Mass., aged sixty-one.

Mr. George F. Elms, M. E., Chicago, has been appointed as an expert to investigate the various water meters in the market with a view to ascertaining which is the best for the use of that city.

Mr. James L. Tompkins has been appointed water commissioner at North Tonawanda, N. Y., to succeed Mr. Nicholas Beckrick, who resigned.

Mr. Thomas Grant died at Bristol, N. Y., Aug. 31, aged fifty-nine. Mr. Grant owned one of the largest bluestone quarries in the state of New York.

Mr. S. Whinery, C. E., Cincinnati, O., was engaged recently by the board of city affairs, Dayton, O., to report on the improvement of the Miami river.

Mr. Otto Weile, City Engineer at Spokane, Wash., has resigned his position to accept that of engineer of the new United States Army Post in that city.

Mr. F. W. Bruce, City Engineer at St. Augustine, Fla., has resigned his position to accept one formerly held by him with the United States Engineer Corps.

Prof. W. R. Hoag, City Engineer of the University of Minnesota, has undertaken to conduct a department in the Minneapolis Times devoted to good roads.

Mr. William G. Pierson, manufacturer of sewer pipes, Brooklyn, N. Y., died Sept. 4 of injuries received several months ago, while driving, in a collision with a trolley car.

Mr. Herbert W. Umney, Assoc. M. Inst. C. E., Assoc. M. E. of England, has been appointed assistant professor civil engineering in the McGill University, Montreal, Quebec.

Mr. Paul Cadevielle has been reelected President of the New Orleans City Improvement Park Association. The other officers and commissioners are: Secretary, Henry Messonnier; treasurer, P. M. Schneidau.

Mr. H. P. Entriken, chief engineer of the water department, Cape May, N. J., has resigned his position because of ill health. He will be succeeded by Mr. Alvin P. Marcy.

Mr. Vernon H. Gridley, Assistant Engineer in the Bureau of Construction and Maintenance of the Department of City Works, Brooklyn, N. Y., died Sept. 17 of typhoid fever.

Mr. Elijah Smith has been elected President, Mr. C. A. Dolph Vice-President, Mr. Prosper W. Smith, treasurer and Mr. N. Poston, secretary of the Oregon Improvement Company.

Mr. Arthur White has been elected street paving inspector at Ft. Dodge, Ia.

Mr. John C. Morgan has been elected councilman at Nanticoke, Pa., to succeed Mr. Benjamin Ford, who resigned.

Majors R. L. Hoxie, W. H. Hein and J. H. Gregory of the Engineer Corps, United States Army, have been appointed board of engineers on the proposed new bridge across the Ohio river at Ironton, O.

Messrs. George H. Kimberly, Malcolm H. Crawford, Arthur T. Phelps, Cornelius Fogarty, James Hamil, Albert Taylor and James H. Covert have been appointed the new Board of Water Commissioners at Watervliet, N. Y. Mr. Hamil is president of the board.

Mr. George T. Gwilliam, who has been associated with the Vulcanite Paving Company of Philadelphia for several years as a civil engineer, has joined the firm of Thayer & Co., who are placing on the market the Cahall vertical and the Babcock & Wilcox horizontal safety water tube steam boilers.

LETTERS FOR THE PUBLIC.

ALTOONA'S REGULATIONS FOR CUTTING INTO STREET PAVEMENTS.

To the Editor of Municipal Engineering:

The accompanying copy of an ordinance regulating trenches and refilling of trenches in this city may be of interest. We have not got it in actual working order yet, but expect to very soon. This ordinance is the work of our ex-City Solicitor, I believe.

I think that for paved streets, or streets about to be paved, it would have been better to allow the City Engineer to actually employ the men and do the work, using stone and sand for refilling where necessary.

The ground here is mostly clay. Flooding with water is not the best thing for making clay back-filling solid, but that is the method we see used most.

HARVEY LINTON, City Engineer.

Altoona, Pa., Sept. 1.

The provisions of the ordinance referred to by Mr. Linton are:

(1.) That it shall be unlawful for any one to dig up any avenue, street or alley for any purpose, except as provided.

(2.) Permits for such excavations must be obtained from the Mayor, and

the work shall be subject to the approval and direction of the City Engineer.

(3.) The charge for each permit is fixed at $25. A contract is required from the party making the excavation, agreeing to restore the good condition of the street. On the fulfillment of this contract for one year the City Engineer will issue a certificate and warrant for the repayment of 80 per cent. of the amount paid for the permit.

(4.) Special supervision may be provided by the City Engineer at an expense of not less than $5, and more may be required if necessary in the judgment of the City Engineer; a bond for payments may be required.

(5.) The Mayor shall give thirty days' notice to make sewer, water and gas connections to persons owning property abutting on streets about to be paved.

(6.) A penalty of from $10 to $50 for violations of the ordinance is prescribed, to which may be added imprisonment of from ten to thirty days.

A MANUFACTURER'S VIEWS AS TO CEMENT TESTING BY ENGINEERS.

To the Editor of Municipal Engineering:

Answering your favor asking us, as manufacturers, whether we think the testing of cement by engineers is in the interest of good work or not, would say that it depends entirely on the knowledge of the man who tests the cement.

It is not an unusual thing for an inexperienced party to condemn a really good cement and accept an inferior one, on the result of his tests, yet we think, if the testing is carried on by persons who understand the business, that as a rule better cement would be used than if no tests at all were made, especially if competition on the work was open to all Portland cements on the market.

However, these remarks apply entirely to physical tests and not to chemical tests. If a cement shows good results from a physical test, the chemical composition must be correct, but a cement could show, according to analysis, all the proper proportions of materials that should enter into a good cement and yet be worthless, on account of the materials not having been properly combined when burning.

Therefore, we think, as the chemical tests could not prove anything at all as to the quality of the cement, which is not already ascertained by physical tests, that the present tendency to include chemical requirements in specifications for Portland cement only adds additional expense to the party having the work done, without giving any beneficial results.

WILLIAM G. HARTRANFT,
V. P. Commercial Wood & Cement Company.

SCIENTIFIC METHODS IN THE USE OF CEMENT.

To the Editor of Municipal Engineering:

It has given me great pleasure to carefully peruse the copies of your magazine each month. I have been more than interested in those articles and letters which have been incessantly gunning after the requirements of cements.

The writer has for years handled almost every brand of cement, American and foreign, on the market, and cannot, at this date, prescribe a single method that would be allowable under all conditions for a fixed analysis or test.

Nowadays it is customary for the engineer or architect to prepare specifications setting forth the requirements of the cement, even going so far as to restrict to a hundredth of a per cent. in chemicals and a fraction of a pound in tensile strength. In order to arrive at these requirements, covering, in many cases, months of valuable time and no little amount of expense, he issues forth from his sanctum, and stands ready to accept or reject, as per the conditions named in his specifications.

This advent is invariably followed by a wholesale condemnation of the brands presented. Then follow a lengthy discussion, in which are presented opinions from so-called experts throughout the country, which are vieing with each other on a hundredth of a per cent. basis. Yes, Mr. So-and-So, when making these diminutive tests, has measured and carefully weighed his other aggregates, and in order to be especially exact has sieved the whole by means of an exceptionally, never-to-be-forgotten, finely meshed sieve. Of course the water was carefully weighed before it was incorporated, and again he wishes you to understand that the same was carefully packed into his briquette molds, and on no account did he ram it. The cement was taken from the same lot by the same man, and in a room having the same temperature, and of course there could be no unfairness regarding his final verdict.

In my experience, with the decision rendered after the above procedure, the cement question becomes a thing of the

past. The successful contractor is then notified of the brand of cement required; he pitches in, and in the place of the scale he uses the shovel, and in the place of the measure he uses the sieve. Mr. Engineer has previously spent his hours on his well-regulated diminutive tests, and he is fully aware of the results. When you wish to consult him, you can find him at his office, or, in some cases, on the site of the operation for an hour or so in a day. The proportions for compounding the concrete were named in his specifications, and as all contractors are honest, he has nothing further to do in the matter but wear his well-earned laurels.

Reviewing the above fact, the writer would suggest that the laborious and painstaking searches into the chemical alysis, as well as the tensile strength, be materially divided, and that at least fifty per cent. of the time so wasted be transferred to that of the actual carrying out of the specifications.

The making of a specification does not imply its fulfillment. The contractor may be honest but he is liable to err; this is usually the case when he is given too much rope.

From the above we can surely arrive at facts that are at least based on common sense.

The writer thoroughly believes in scientific researches, but not to the extent to which they are being carried, especially when it is at the expense of another brand of cement.

WARNER H. JENKINS.

Philadelphia, Sept. 4.

ASPHALT IN TEXAS.

To the Editor of Municipal Engineering:

For the information of the many readers of your magazine we wish to submit an analysis of the asphalt-rock found in Uvalde county, Texas, 112 miles west of San Antonia, where an extensive plant is now in operation, representing an expenditure of over three hundred thousand dollars, to get the material on the market for street paving and all other purposes for which asphalt is adapted. The analysis is by Prof. A. L. Metz, Professor of Chemistry, Tulane University of Louisiana and chemist for the city of New Orleans: Water, 00.27; asphalt, 13.68; sulphur, trace; iron pyrites, trace; alumina, 0.60; magnesia, 0.31; carbonate of lime, 82.06; silica, 3.08; total, 100 per cent.

This material is found in practically unlimited quantity. We have laid one street in this city under contract to maintain without expense to the city for a period of fifteen years. Municipal Improvement Co., by J. S. M'NAMARA,

President.

San Antonio, Tex., Sept. 9.

MACHINERY AND TRADE.

RECENT INVENTIONS.

[Reported specially for MUNICIPAL ENGINEERING, by A. I. Gardner, Attorney at Law and Solicitor of Patents, Loan and Trust Building, Washington, D. C. Copies of any patent can be secured for ten cents each.]

565,491. Apparatus for Treating Sewage. O. E. Meyer, Milwaukee, Wis. The sewage is discharged into a settling-tank through a chute which diverges horizontally toward its discharging end to the width of the settling-tank, and a filter opens into and leads out of the opposite side of the settling-tank and of about the same width as the settling-tank.

566,233. Compound-Truss Bridge. J. H. Semmes, Meridian, Miss.

565,970. Water Trap for Gas Mains. M. Farrell, Buffalo, N. Y. The combination with a water-chamber having an inlet and an outlet of an outlet-valve controlling said outlet, a main float connected with said valve, a balancing-pan arranged adjacent to said inlet and connected with the main float and the outlet-valve, a valve arranged on said pan and an auxiliary float adapted to engage with the valve of the balancing-pan.

566,324. Process of Purifying Water. C. H. Kendrick, Winchester, N. H. Consists in subjecting it to the action of a coagulant composed of a comminuted alloy of aluminium; and then separating the coagulum from the water.

566,716. Leveler and Grader. D. W. Jones, Salt Lake City, Utah. Consists of a frame having upright posts set slightly apart, a top or seat-beam on said posts, a lever-beam between the posts, treadles on opposite sides thereof, a hanger at the rear end of the lever-beam, a spring supporting the rear end of the lever-beam and chains connecting the tool with the main frame.

566,960. Guard for Bridges. T. H. Andrew, Lemars, Iowa. The combination of a vertically movable frame, a longitudinal shaft having a crank, a link-bar connecting the crank with the vertically movable frame, a gear-wheel located beyond the abutment and provided with a horizontally disposed pin, and a rack-bar designed to be carried by a bridge and meshing with the gear-wheel, and provided with a depending pin adapted to engage the pin of the gear-wheel.

RIVAL MANUFACTURERS OF CLAY-WORKING MACHINERY UNITE.

Two of the largest and best-known clay-working machinery concerns in the United States, the Frey-Sheckler Company of Bucyrus, O., and J. W. Penfield & Son of Willoughby, O., have been merged into a stock company styled the American Clay-Working Machinery Company. To this company has been sold the machinery, manufacturing plants, patterns, patents and good will of both the old concerns. The arrangement is not a trust or pool, but is a permanent change in organization. The sale and conveyance of the two plants is absolute and the new company will hereafter be vested with the entire manufacturing business of both the old ones.

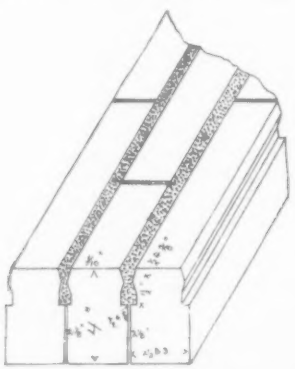
Both of the parties to this transaction have been long and favorably known to the clay-working fraternity. It is now forty years since the business of the Penfields was started by J. W. Penfield, while that of the Bucyrus company commenced some four and thirty years ago. For years they have been active rivals and strong competitors. Each has had immense plants, claimed to be more extensive and better equipped than any other in America or Europe. Each has maintained a corps of skilled employee and salesmen and has reached out in every possible direction for extension of business relations and increase of trade.

The conditions leading to the change in organization may be briefly stated as follows: During the past year the clay-working trade has greatly felt the depression existing in all other lines of business. Owing to this fact the prices of machinery have been steadily on the decline, and dangerously extended terms of payment have been conceded to purchasers of this line of goods. At the same time the cost of producing and selling machinery has continued to be about the same, being largely out of proportion to the results obtained. Furthermore, there was liability of expensive and annoying litigation between the two concerns as to the ownership of valuable devices and improvements. After fully considering the situation the two rivals decided in the interests of economy to make a truce.

The American Clay-Working Machinery Company is incorporated with a capital stock of $600,000. In the selection of officers J. W. Penfield has been chosen as president, the other officers of the company being as follows: First Vice-President, R. C. Penfield; Second Vice-President, C. W. Fisher; Secretary, W. W. Reehl; Treasurer, J. B. Gormly; General Manager, W. C. Lemert. The general offices of the company will be located at Bucyrus, O. The several departments of the two companies will be merged and the list of machinery produced will comprise all of the lines formerly made by the individual concerns.

A NEW DESIGN FOR PAVING BRICK.

S. J. Hatch, of Kansas City, Mo., has invented a new design for a paving brick. In a letter to Municipal Engineering he says that the object of the invention is to prevent chipping or spalling off of "the edges, to give the brick an elastic cushion, give an even wearing surface, decrease the noise and increase the life of the pavement. These are things that are agitating the minds of the brick



manufacturers and those interested in brick pavements. The question of toughening the brick so as to prevent the clipping has been discussed, and it has been recommended that a mixture of several kinds of clay be used; that repressing the brick and a more complete process of annealing be used, etc., all of which, while an improvement, does not overcome the difficulty. The inventor has ex-

perimented all along this line, and has concluded that unless the edges are protected it is almost impossible to make a brick that will not chip. The best granite chips and wears at the edges, leaving an uneven top surface. As will be noticed, the brick has first an outward bevel from the top. This adds strength to the edges. Then there is a corresponding bevel. This forms shoulders that rest on the filler, and the filler being an asphalt mixture is elastic, consequently it allows the brick to give when the load passes upon it. The brick finally rests upon the sand bed, or, as it is sometimes called, "cushion," and when the load passes off the brick springs back.

"The joints or interstices of the present pavement are so small and deep that a pitch filler cools and clogs the joint near the top, leaving an imperfect job, while with cement or grout it must be made so thin that much of it passes into the sand bed. The proposed brick leaves a space large enough to insure a full and complete joint. The asphalt will not cool or become stiff before the joint is filled. If cement or grout is used it can be made of about the consistency of thin mortar. In large cities where the steel sweeper is used asphalt filler should be used, as cement will chip and the particles be either swept or washed out, and in time the edges of the brick will be exposed to the wear.

"There is an advantage to the manufacturers, from the fact that on account of the size and shape of the brick, the top or wearing surface being smallest and more open space left round it, it burns more readily, and as it is only important that the top or wearing surface should be hard, it will require less full time and labor in burning. The bottom of the brick is square, and those not suitable for paving can be used for building purposes. It is estimated that a saving of 15 cents per 1,000 can be made. The asphalt filler can be put in place for the same cost, or less than any other filler in the market.

"I notice in your last issue an article on the expansion of brick pavements. The filler I propose using will not go below the shoulders or the feet. There will be a small space left between the bricks from the shoulder down to the bottom of the brick sufficient to allow of expansion, and when this expansion takes place the asphalt will be soft enough to simply raise in the joints."

TESTS OF VULCANITE PORTLAND CEMENT.

An item in the September number of Municipal Engineering referring to tests of Vulcanite Portland cement, showing an average tensile strength of 400 pounds for nine months, inadvertently failed to mention that the briquettes used in the tests were from a composition consisting of three parts sand and one part Vulcanite Portland cement, and the tests making this excellent showing were, therefore, not made from neat cement, as might be mistakenly supposed.

TRADE NOTES.

The manufacture of paving brick has been begun at Canton, Ill.

The council at Shawano, Wis., has voted to purchase a stone crusher.

The United States Sewer Pipe Plant, Lisbon, O., has been closed down.

A sewer catch basin has been invented by Marion Hearshman of Des Moines, Ia.

Extensive repairs and improvements are being made at the St. James Cement Works, Lynchburg, Va.

Frorer & Harts, Lincoln, Ill., contemplate engaging extensively in the manufacture of paving brick.

A company is being organized by J. A. Jackson to manufacture artificial stone pavement at Paducah, Ky.

The plant of the Eureka Fire Brick Company, Mount Braddock, Pa., has closed down its plant for the season.

The Pennsylvania Asphalt Company will, according to press reports, build a new asphalt plant in Pittsburg, Pa.

The Garrison Paving Brick Company, Houston, Tex., has been incorporated by G. F. Arnold, W. M. Mitchell and A. P. Root.

The daily output of paving brick, beginning Sept. 7, was increased to 100,000 at Catskill, N. Y. The output for some time past has been 85,000.

The city of New Haven, Conn., has purchased two portable stone crushers at a cost of about $2,000 each of the Farrell foundry at Ansonia, Conn.

The Miller Street Sewer Company, Shelbyville, Ind., was incorporated Aug. 28. Judge Hackney of the Supreme Court is one of the incorporators.

Hetherington & Berner of Indianapolis have about completed a stationary asphalt plant at Kansas City for the Parker-Washington Company.

The purchase of a steam roller is contemplated at Franklin, N. H.

The clerk at Santa Ann, Cal., has been authorized to advertise for bids for a street sweeper.

The Rotary Snow Plow Company has been incorporated at Paterson, N. J., by John S. Cooke, Fred W. Cooke, Charles D. Cooke and William Berdam.

The purchase of a steam road roller and of two street sweepers was recommended to the council recently at Memphis, Tenn., by Street Commissioner Powers.

The Chautauqua Cement Works, Moons, N. Y., have been sold by the sheriff, to satisfy a judgment of $35,000. C. M. Reed, Erie, Pa., purchased the plant for about $36,000.

The entire plant of the Chickasaw Asphalt Company, which was located at Woodford, I. T., was totally destroyed by fire Sept. 11.

The purchase of a six-ton road roller is contemplated at Birmingham, Ala. Address Mayor Van Hoose, who has charge of the matter.

The city council, Worcester, Mass., has authorized the street commissioner to purchase a steam road roller at a cost not to exceed $3,000.

An asphalt mixing plant will be constructed at Los Angeles, Cal., by A. N. Millspaugh, who is the sub-contractor for the Main street paving work.

The contract for furnishing and depositing stone in the gap at the Delaware breakwater was awarded to John F. Donovan of New York City, whose bids aggregated $55,920.

The Buena Vista Fire Clay Works, Baltimore, Md., has been sold to Henry J. Quandt of Chicago, who began the manufacture of tiling, terra cotta, drain pipe, etc., Sept. 1.

The asphalt paving plant of the Warren-Scharf Asphalt Paving Company, Milwaukee, Wis., was badly damaged by fire Sept. 18. The work of rebuilding was commenced at once.

A bridge guard has been invented by T. H. Andrews of Le Mars, Ia., which can be arranged at each end of the bridge, to prevent trains from going through open bridges. The guard is regulated by mechanism which opens and closes the bridge; when open a section of the track at each end is elevated several feet, which forms an obstruction of such strength that it will stop a train moving at more than a moderate rate of speed. At night, when the guard is in operation, a light is automatically turned off or on, as required.

The Louisville Brick and Tile Company, Louisville, Ky., will rebuild its plant, which was recently destroyed by fire. Messrs. Keim & Brumbaugh are the proprietors of the company.

The purchase of a road roller and street sweeper is favored by the street committee of councils, Lancaster, Pa., and a special report will be made recommending their purchase. Chairman Trout.

The recent tests of Galesburg brick from the Purington works, to be used in paving Locust and Sixteenth streets, at Davenport, Ia., are reported by Cimmissioner Boynton as exceptionally satisfactory.

The Utah Asphaltum Company is reported to have just sold a car of asphaltum for eastern shipment, for which, if it proves satisfactory, a steady market will be found for all the company can mine.

A granite sea wall, three feet thick and 330 feet long, will be constructed at the East River Park, New York City, to pevent the occasional washing away of a portion of the park on East End avenue.

Plans have been completed for constructing shale brick works at Saugerties, N. Y., the entire product of which will be used for paving and road construction. New York and Philadelphia capitalists are interested.

The Topo Paving Company has been incorporated at Salinas City, Cal., to produce and deal in paving material. The incorporators are: N. A. Dorn, Samuel Matthews of Domingo Villa, and Joseph Eades, jr., of Salinas City.

The organization of a stock company is proposed at Harriman, Tenn., to manufacture paving brick. Recent tests have been made of the different kinds of clay around Harriman with satisfactory results. Summer Emery is interested.

The Kentucky Fire Brick Company, Indian Run, Ky., has begun action in the United States Circuit Court, against D. R. Lear of Pittsburg to recover $30,000 for non-fulfillment of a contract. The defendant was to erect ten kilns for firebrick for $10,500, and furnish an experienced man to operate them. Failure to furnish a skilled man resulted in rendering the kilns worthless, it is claimed.

The Columbia Construction Company, Camden, N. J., has been incorporated to construct all kinds of public works. The incorporators are: William S. Kirk, Westchester, Pa.; John S. Dove, jr.; Archibald S. Dewey, S. M. Lisson and W. B. Ranch, Philadelphia, Pa.

A new cement testing machine has been placed in operation at the city hall at Lowell, Mass., to take the place of a small machine which has been in use in the sewer department for fifteen years. The new machine will test as high as 2,000 pounds.

The George B. Inman Contract Company has been incorporated in New York City to contract for the construction of water works, gas and electric light works, electric railroads, etc. The directors of the company are: George B. Inman and Edmond Hunt, New York City; George Frohl, Brooklyn.

The offices of The Colliery Engineer Company, proprietors of The Colliery Engineer and Metal Miner, Home Study and The International Correspondence Schools, in the Coal Exchange building, Scranton, Pa., were partially destroyed by fire on Sunday morning, Aug. 30. Fortunately their printing plant was in another building and they had reserves of all instruction and question papers, drawing plates and other supplies and stationery used in the schools in still another building, so that their business will not be seriously interfered with. The company is temporarily occupying the eighth, ninth and tenth floors of the fire-proof Mears building, where they will remain until the completion of their new building. Instructions of students in their school has not been interrupted by the fire.

The plant of the Iowa Pipe and Tile Company, Des Moines, Ia., was destroyed recently by fire, which is supposed to have originated from an overheated kiln. The officers of the company, Messrs. F. A. Percival, J. A. Garver and C. A. Rawson, announce that the plant will be rebuilt at once.

The Phillipstown Crushing Company has been incorporated at Cold Springs, N. Y., to deal in road machinery, to contract for crushing stone, and to construct and repair roads. The incorporators are Henry Metcalf and Richard Giles of Cold Spring, and J. M. Touchey and William Church Osborne of Garrisons, N. Y.

Cement works will be constructed at Carpenterville, N. J., by New York capitalists, who contemplate having it completed by February, 1897. New and improved machinery will be placed in the plant, which will have a capacity of 600 barrels of Portland cement a day. A. M. Bigelow will manage the new enterprise.

SELECTIONS FROM THE PRESS.

A SUCCESSFUL MAGAZINE.

(From the Indianapolis Journal, Sept. 7, 1896).

The story of the development of the Municipal Engineering Magazine, the main office of which is located in Indianapolis, from a very small beginning into one of the largest technical publications in America, is an interesting bit of publishing history. It was started in 1890 as an unpretentious little sixteen-page journal under the name of Paving and Municipal Engineering, not "to fill a long-felt want," but rather as an immediate convenience to the editor. It was an outgrowth of the Paving Exposition, which was made such a marked success in Indianapolis and has since been imitated on a smaller scale in several cities. The exposition gave to Indianapolis a wide reputation, particularly among the smaller cities, as headquarters for valuable information about street improvements, and this suggested to William Fortune, who was in charge of the arrangements for the exposition, that the distinction of the city in this respect could be best emphasized and maintained by the publication of a journal identified with street improvements, while it would at the same time relieve his correspondence somewhat and would probably be sufficiently worth while in a business way. But the business end of it troubled him. He couldn't undertake to look after that, and not having the right man at hand for the work, gave up the idea; but it wouldn't down. He spoke about it one day to William C. Bobbs, the present manager of the publishing firm of Bowen-Merrill company. Mr. Bobbs at once became very enthusiastic over the idea and expressed a desire to join in the project as business manager. The offer was accepted and the first number was soon issued, after a very encouraging response to the prospectus, which had been sent out, much of the preferred advertising space having been engaged by telegraph.

The publication gained in strength and proportions until, in 1893, it was changed to magazine form, and the business having in the meantime passed into the hands of the Municipal Engineering Com-

pany, most of the interest of Mr. Bobbs was bought in 1894 by Mr. Fortune.

The magazine has grown rapidly in the last two years. Its average monthly gain in 1895 was 40½ per cent. a month over 1894, and the increase during 1896 over last year has averaged about 65 per cent. a month. It is recognized as the foremost representative of the interests connected with the improvement of cities, embracing the field of paving, sewerage, water works, parks, etc. It circulates largely among the people who are interested in these matters throughout the United States and Canada, and to some extent in foreign countries. It holds the world's fair award of a medal and diploma for excellence.

Leading daily newspapers, such as the Boston Herald, Philadelphia Press, Detroit Tribune, Milwaukee Sentinel, Omaha Bee, Minneapolis Journal, New Orleans Picayune and others of like rank, accord it attention in the review of periodicals equally with the leading popular magazines. Probably no technical publication has received more attention or more praise from this source. The Sacramento Record-Union says "it is one of the most valuable technical publications of the age." The Milwaukee Sentinel calls it "a model high-standard publication." The Detroit Journal says "it has been a large factor in an educational way in the remarkable progress in the improvement of American cities in the last few years." The Topeka State Journal refers to it as "the American magazine which has done so much to enlighten the public regarding the improvements of cities." The Kansas City Times speaks of it as "the most helpful publication in America to all who are interested in public improvements." The Hartford Courant calls it "an excellent magazine." The Detroit News speaks of it as "indispensible." The Philadelphia Press says "it is itself a good example in enterprising and progressive work," and the Portland (Ore.) Express says: "Municipal Engineering is contemporaneous with the era of the most intelligent and thorough modern work in the physical improvement of the cities of this country." It has been further said of the magazine that its volumes constitute a library of the best literature in existence on the improvements of cities. The demand for complete files of it for college, municipal and professional engineering libraries has resulted in a standing offer of $1 per copy for early numbers, sold originally at 10 cents.

The success which has brought the magazine up from sixteen pages to the proportions of 128 pages a month in a few years is attributed largely to the qualities which have been so generously praised by the press. Its editorial policy has been to rely on men whose technical education and experience has distinguished them as the best qualified to discuss the questions treated in the magazine. These men are experts in their special branches, and their writings for the magazine are incidental to their practical work. Civil engineers, analytical chemists, contractors and others who have achieved the distinction of being foremost of their class have been among the writers for the magazine.

The latest issue is an instance of its quality in this respect. Among its leading articles is one by Leon Malo, for thirty-seven years the consulting engineer and the manager of the Seyssel asphalt mines in France, and who was decorated as a knight of the Legion of Honor for his writings on asphalt. Another contributor in the same number is Dr. Irving A. Bachman, Ph. D., D. Sc., the foremost authority in America on Portland cement, and still another is Robert Grimshaw, a distinguished author of books on engineering subjects and for many years a United States consulting engineer. Mr. Grimshaw is the special representative of the magazine in Europe, where he has been engaged for several months in gathering information for a series of articles on engineering work in the leading cities of the continent. The magazine has already in hand enough manuscript from him, together with photographs and sketches for illustration, for a year, but Mr. Grimshaw will continue his work until he has exhausted the field, which is, of course, a very large one. Indeed, it is stated that the supply of manuscript on important technical subjects which has been accumulated by the magazine is quite sufficient to fill its space for many months should nothing additional be obtained. This stock is, however, continually being added to, and new arrangements are being made for important investigations and valuable contributions.

In pursuance of the aim to make itself of indispensable value the magazine undertakes to furnish its readers the services of a consulting engineer to a limited extent without charge, and has regularly in its employ civil engineers who answer such questions as may be submitted. The usual professional charge would in any case be several times the subscription of the magazine.

The news service of the magazine is furnished by correspondents in the leading cities and towns, numbering nearly 500, and is compiled from newspaper clippings, of which several thousand are received each month from bureaus in Chicago, New York and Boston. These clippings are verified by the news editor of the magazine through correspondence, as accuracy is one of the principal requisites in a technical publication. Bulletins are made up from them and sent to advertisers in advance of publication in the magazine, thus keeping them promptly informed of all opportunities for business in their respective lines.

The aim in every feature of the organization for conducting the business has been to render every kind of service that will make the magazine valuable to readers and helpful to the business of its advertisers. It has some large advertisers who know how to use their space in an interesting way, but it has been the business policy of the magazine to direct general effort chiefly toward building up with small advertisements, on the theory that there will be less fluctuation in the business and larger relative profit.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Rockfield, Ill.—Heavy rains washed out the cedar block paving for long distances about Sept. 14.

Du Bois, Pa.—The Clearfield Clay Working Company, Clearfield, Pa., began paving S. Brady street, Aug. 25.

Scranton, Pa.—The Metropolitan Paving Company, New York City, has entered the field of competition for paving contracts in this city.

Muncie, Ind.—This city will soon have fifty blocks of asphalt paved streets, that have been laid by the Warren-Scharf Asphalt Paving Company.

Rockford, Ill.—R. A. Shepard, chairman street committee, and C. T. Nordstrom, superintendent of streets, visited Galesburg, Aug. 29, to inspect brick paving and brick manufacturing plants.

Marion, O.—Councilmen Frederick Strobel, Jacob Maag, O. W. Wallenweber, John Schutt and Wesley Harsch and City Engineer James Scott visited Zanesville recently to inspect paving brick.

Northampton, Mass.—Much interest was developed at the public hearing of the State Road Commissioners Sept. 3, and representatives were present from many towns asking for state roads.

Milwaukee, Wis.—At the end of 1896 sixteen blocks of permanent street pavement with a concrete foundation and asphalt or vitrified brick surface will have been added to the five miles that existed in Milwaukee at the beginning of the year.

New York, N. Y.—The Second Avenue Railroad Company refused recently to comply with Commissioner Collis's order to pave First avenue between its tracks with asphalt. The city commenced the work Sept. 14, and will sue the company for the cost.

Philadelphia, Pa.—The Alcatraz Paving Company, which has the contract for relieving the bottom and inner slopes of the north basin of the Roxborough reservoir, is about ready to begin the work. J. S. Jackson of San Francisco will superintend the work.

Chicago, Ill.—The Assyrian Asphalt Company, which had the contract for paving Jackson Boulevard, from Halsted to Canal Street, reported to the West Park Board, Sept. 8, that it would be unable to complete the work by Oct. 25. The company was released and the work awarded to the next lowest bidder, the Western Paving and Supply Company.

Manchester, N. H.—The street and park commissioners complain that the appropriations made for their work are too small; that they have used the money given them honestly and to the best of their ability, but lack of funds prevents them from making all the improvements needed.

Kansas City, Mo.—The Board of Public Works, at a meeting held Sept. 8, discussed the advisability of licensing sidewalk contractors. City Engineer Wise reports the laying of a great many inferior granitoid walks throughout the city and suggested a license tax as a possible remedy.

Dayton, O.—The City Civil Engineer rejected the paving between the tracks on S. Brown street on account of the cement used in the concrete not drying or becoming hard. The cement was tested before it was put in and found to be all right. The pavement will have to be relaid.

New Haven, Conn.—A severe test was given the brick pavement on York street recently, when a large truck loaded with a big boiler passed over it, leaving it intact. When the truck turned round into Chapel street it broke in pieces the Belgian block pavement in that thoroughfare.

Newark, N. J.—Superintendent Mundy of the Board of Works has determined to prosecute any offender against whom he can secure evidence for throwing grass and other refuse upon streets paved with asphalt. This action on the part of residents has proved a great source of annoyance lately.

Des Moines, Ia.—The state refuses to pay for paving the intersection of streets, and Attorney-General Remley, in an opinion, states that the state is not a private individual, and cannot, therefore, be made to pay for the intersections. A paving contest, similar to that over W. Ninth street, is feared.

Los Angeles, Cal.—The property owners on Ninth street, between San Pedro street and Central avenue, have protested against the acceptance of the grading, curbing and sidewalks owing to the inferior quality of the gravel, cement and asphaltum, and the unworkmanlike manner in which the work has been done.

Buffalo, N. Y.—President Wilson of the Board of Health attributes the low death rate during the first six months of this year to the improved sanitary condition of this city. He says: "The fact that many thoroughfares on the East Side are now asphalted enables the street cleaners to do their work better. This has the effect of improving the health of the city."

Philadelphia, Pa.—The question of asking the city authorities to provide road maps for the benefit of the cyclists, showing the streets laid with asphalt, is being discussed, but nothing definite has yet been done. The greatest argument in favor of the maps is that they seem to meet the wishes of cyclists, the cost of which, roughly estimated, would not be very great.

Halifax, N. S.—This city has been making experiments with paving materials for sidewalk construction. The City Engineer recommends concrete on level streets and asphalt for hills and less important streets. The estimated cost of the asphalt walks, 70 cents a square yard, would indicate that it is not the kind of material that is used for paving streets. The estimated cost of the concrete walks is $1.83 a square yard.

Milwaukee, Wis.—The special committee on street paving material, appointed recently by the common council, reported Sept. 3 against laying any more cedar block pavements on plank foundation and recommended that hereafter all pavements be laid on concrete foundation.

Detroit, Mich.—An injunction to restrain the Talbot Paving Company from paving Jefferson avenue, from Crane avenue to the city limits, was obtained by the Citizens' Street Railway Company Sept. 18. While the company protests that the council should respect the charter, which forbids paving a street until one year after the sewer pipe is laid, its desire is said to be to defer paving between the tracks this year. A motion for a dissolution of the injunction has been made.

Rochester, N. Y.—A motion has been made by City Attorney Rodenbeck to dissolve the temporary injunction granted some time ago restraining the executive board from laying the Exchange street pavement. Mr. Rodenbeck sustains the position of the aldermen that the street car company can be compelled to lay that portion of the pavement between their tracks; also, that as the company, under the city charter could not be assessed for the improvement of streets as local improvements, this was the only way to make the company share a portion of the burdens.

Scranton, Pa.—An asphalt litigation, similar to the one recently ended at Wilkesbarre, is threatened in this city. Dunn Bros. have the contract for paving Monroe avenue, but one sample of asphalt submitted to City Engineer Phillips proved of an inferior quality. A second sample has been submitted, but has not yet been tested. Dunn Bros. have sent word to the City Engineer that there will be no cause for interference on his part regarding their laying the asphalt as they propose to use material that will meet the requirements of their contract, the specifications for which call for Pitch lake asphalt or asphalt proven as good.

CONTEMPLATED WORK.

Dalton, Mass.—A macadam road will be constructed.

Buffalo, N. Y.—Seneca and Franklin streets will be paved.

Connellsville, Pa.—Paving is contemplated for Water street.

Leavenworth, Kas.—Asphalt paving is contemplated for Fifth avenue.

Yardley, Pa.—A curbing and paving ordinance has been passed.

Butte, Mont.—Park street will be extended at a cost of about $4,000.

Toledo, O.—An ordinance was passed Sept. 21 to pave Elizabeth street.

Mt. Vernon, N. Y.—Mayor Edwin W. Fiske urges a number of street improvements.

Lansingburg, N. Y.—Brick paving is being considered for Second avenue.

Columbus, O.—Bids have been authorized for improving Town and Pearl streets.

Pomona, Cal.—The city trustees have passed a resolution to pave Second streets.

San Francisco, Cal.—The question of repaving Fourteenth street is being considered.

Winona, Minn.—An additional block of brick paving is contemplated for Center street.

Dixon, Ill.—Macadam is proposed for A street and for portions of First and B streets.

Milwaukee, Wis.—East Water street, from Mason to Wisconsin, will be paved with asphalt.

Roxbury, Mass.—An appropriation of $625,000 has been made for improving the streets.

Norristown, Pa.—Brick paving is contemplated for certain streets about the city hall.

San Francisco, Cal.—Petitions have been filed for bituminous rock paving in certain streets.

Bay City, Mich.—The question of repaving Center avenue is being discussed by the city council.

Lancaster, O.—Main street, from Broad to Maple, will be paved with brick. H. T. Mechlin, City Clerk.

Pekin, Ill.—The construction of about 10,000 lineal feet of brick sidewalks is contemplated.

Evansville, Ind.—A resolution has been passed for paving a portion of Louisiana street with brick.

Sea Cliff (L. I.), N. Y.—This town has voted to issue $50,000 in bonds for constructing macadam roads.

Waukesha, Wis.—The question of issuing $16,000 in bonds for streets and sewers is again being considered.

Oswego, N. Y.—Brick and asphalt paving is contemplated for several streets. H. D. McCaffery, President Board of Public Works.

New Albany, Ind.—A macadamized road is being considered by the citizens residing along the Charleston road.

Tampa, Fla.—The property-owners have decided on asphalt for a material for paving W. Lafayette street.

Omaha, Neb.—The property-owners on Twenty-sixth street, from A to F, have asked that the street be graded.

Brooklyn, N. Y.—Asphalt paving is being considered for Ocean and Flatbush avenues, opposite Malbone street.

Wildwood, N. J.—The question of issuing $50,000 in bonds for general improvements was favorably voted on Sept. 8.

Springfield, Mass.—A large amount of brick paving is contemplated by this city by day labor.

Milwaukee, Wis.—Asphalt paving is contemplated for Third street, from Everett to W. Water.

Scranton, Pa.—The City Engineer has been directed to pave Keesler court with vitrified brick on concrete.

Scranton, Pa.—Bids will soon be asked for 23,700 square yards of asphalt paving. Joseph P. Phillips, City Engineer.

Covington, O.—The question of issuing $75,000 of bonds for paving the streets with brick will be voted on.

Jamaica, L. I.—An appropriation of $150,000 for macadamizing and general road improvements is contemplated.

Somerville, N. J.—The board of commissioners has decided to macadamize High, Bridge and a portion of Hamilton streets.

Meridian, Miss.—An ordinance has been passed which provides for paving the sidewalks in a large number of streets.

Sterling, Ill.—About 18,000 square yards of macadam and 7,000 lineal feet of curbing is contemplated for this city.

Poughkeepsie, N. Y.—Asphalt and brick paving is being considered for certain streets by the Board of Public Works.

Hagerstown, Md.—The Mayor and Council authorized, Sept. 10, the issue of $7,000 worth of bonds for street paving purposes.

Meadville, Pa.—Strong protests are being made among the boroughs of this county against the condition of their sidewalks.

Hoboken, N. J.—A large number of streets will be paved with asphalt. An appropriation of $200,000 has been made for that purpose.

Hartford, Conn.—Mulberry street, from Main to Wells, will be paved with Trinidad Lake sheet asphalt during the season of 1897.

Owensboro, Ky.—The question of issuing $25,000 in bonds for paving and $25,000 for erecting an electric light plant, will be voted on Nov. 2. H. M. Talbot, City Engineer.

Bay City, Mich.—The county commissioners have concluded to build nine miles of roads in Mount Forest and Gibson townships.

Reading, Pa.—The ordinance providing for brick paving for Penn street, has finally been passed by a vote of 13 to 2.

Patchogue (L. I.), N. Y.—Bonds to the amount of $20,000 have been voted for improving the roads. H. L. Losee interested.

Passaic, N. J.—Ordinances were passed Sept. 22 for macadamizing High and Monroe streets, Paulison avenue and the Boulevard.

Montville, Conn.—A road will be built from the farm of Joseph Moxley to that of Sylvester Jerome, a distance of about one mile.

St. Joseph, Mo.—The common council will consider the proposed construction of suitable sidewalks to the High School building.

Manchester, N. H.—A petition is being circulated by a number of citizens in West Manchester asking that Railroad street be improved.

San Diego, Cal.—The paving of Fifth street, at a cost of about $18,000, has been recommended to the council by the street committee.

Albany, N. Y.—The State Canal Board has set aside $3,000 additional for repairing thirteen miles of state road. G. W. Aldridge, Superintendent Public Works.

Clockville, N. Y.—A special town meeting was held Sept. 8 to consider methods for raising money for highway and other improvements.

Sandusky, O.—A resolution has been passed for paving with brick and curbing Hancock street, from Water to Scott. A. W. Miller, City Clerk.

Newark, N. J.—An ordinance has been passed for paving Holland street, from Springfield avenue to S. Tenth street, with Trinidad Lake asphalt.

Atlanta, Ga.—The conference committee of council has recommended the repaving of Whitehall street, from the railroad to Mitchell street.

Cincinnati, O.—Engineer Stanley has been instructed to prepare the necessary resolutions for paving Spring Grove avenue with brick.

Norwalk, Conn.—A petition has been presented to the city council asking that Wall street be repaved with vitrified brick.

Indianapolis, Ind.—A petition has been presented to the Board of Public Works for brick paving for the first alley north of North street.

Syracuse, N. Y.—The common Council has decided to open the competition for paving E. Genessee street with asphalt.

Newport, R. I.—A resolution was passed Sept. 5, transferring the sum of $3,000, from the appropriation for sewers to that for streets and highways.

Troy, N. Y.—Bids will be wanted for paving Second avenue, for a distance of about 4,000 lineal feet. Macadam is proposed for Fifth avenue also.

Toronto, Ont.—A. H. Keating, City Engineer, in his last report, recommends brick paving for seven streets, asphalt for two and Macadam for one.

Columbus, O.—The property-owners on Oak street, between Washington and Parsons avenues, have asked the council to pave that street with asphalt.

Haverhill, Mass.—Contracts will be let this fall for a state highway from River street to the Lawrence road, so that work can begin early in the spring.

Cranston, R. I.—A proposition to appropriate $12,000 for completing and rebuilding Cranston street was considered at a special financial meeting Sept. 17.

Woodbury, N. J.—A resolution to build a stone road between Paulsboro and Swedesboro, a distance of six miles, has been adopted. John S. Jessup, County Solicitor.

Newark, N. J.—The residents on Astor and Linden streets have asked that the paving now under way on these streets be changed from brick to asphalt.

Toledo, O.—The property owners on Fourth street are circulating a petition asking that Townsend block with Medina curb be used in the improvement of the street.

Des Moines, Ia.—The citizens of Oak and Highland Park have urgently requested the board of public works to pave at the earliest possible date.

Whitestone (L. I.), N. Y.—A petition is being circulated to call an election to vote on the question of issuing $50,000 in bonds for improving the streets.

Kansas City, Mo.—The Board of Public Works authorized, Sept. 18, the paving of Sixth street, from Walnut to McGee, with brick at a cost of $1.40 a square yard.

Duluth, Minn.—The question of constructing a wagon road in Canosia will be considered by the county commissioners Oct. 6. John Hawkinson, Superintendent of Roads.

Jersey City, N. J.—A resolution has been adopted providing for an asphalt road from the Pennsylvania Railroad Company's ferry to the Hudson County boulevard.

St. Paul, Minn.—The Commissioner of Public Works and the City Engineer have been directed to open a roadway from Jackson street to Eagle, a distance of half a mile.

St. Paul, Minn.—A preliminary order for improving Iglehart street, from Cleveland to Wheeler avenue, has been favorably reported on by the Commissioner of Public Works.

Johnstown, Pa.—The Johnstown, Indiana & Westmoreland Pike Company has been organized to construct a road from Nineveh to Johnstown, by A. J. Haws, James Green and David Berry.

San Rafael, Cal.—Specifications and profiles have been completed by George L. Richardson, county surveyor, for the Tiburon and San Rafael boulevard, which will be a continuation of Irwin street.

Yonkers, N. Y.—William H. Baldwin, Engineer Board Water Commissioners, has been appointed to lay out and supervise the improvements to be made at Fairview, which consists of curbing, guttering and macadamizing.

Harrisburg, Pa.—Green and Front streets will be graded. The ordinance directing the construction of a pavement in Delaware avenue, from Second to Third, has been reported affirmatively.

Chicago, Ill.—The business men in Thirty-first street have appointed a committee to form a permanent improvement association to improve that thoroughfare from a business standpoint. H. H. Hammond, Chairman.

Bridgeport, Conn.—Brick paving is contemplated between the trolley tracks in Fairfield avenue and State street. A committee visited Philadelphia Sept. 10 to inspect that city's method of paving between the tracks.

Saginaw, Mich.—It is estimated that about $120,000 will be expended next year for street improvements. Asphalt, brick, cedar blocks and macadam paving for several streets is included in the proposed improvements.

Westerly, R. I.—Permanent paving is favored for Canal, High and Main streets by many of the property-owners, who believe it would be economy to pave these streets instead of being obliged to top-dress them so often.

Jersey City, N. J.—The recommendation of Mayor Wanser, to appropriate $75,000 out of the liquor license fund for asphalt paving, has been acted on by the Jersey City finance board. Bright, Mercer, Henderson, York, Montgomery, Third, Second and Fourth streets will be paved with Belgian blocks.

Detroit, Mich.—A resolution has been adopted by the common council ordering the paving of the block bounded by Adelaide, Winder, Russell and Market streets with Trinidad or Bermudez asphalt on concrete, and Chandler street with cedar blocks with Medina curbstone.

Memphis, Tenn.—Mayor W. L. Clapp suggests that the $80,000 which will remain to the credit of the streets and sewers fund be used in paving Beale, Union, Monroe and Madison streets, and in completing the north outlet of the main line of sewers. Tennessee street, from Calhoun to Butler, will be paved with granite.

Omaha, Neb.—The City Engineer has been instructed to draw plans and specifications for about one and one-half miles of macadam road, to be built this fall, and for one mile of asphalt paving on S. Sixteenth street, which may be completed this fall. Center street will be macadamized for several miles beyond the city line.

San Francisco, Cal.—The business men and residents of Fourth street have become aroused to the condition of that thoroughfare and are unanimous in the determination to have it paved.

Omaha, Neb.—The proposed repaving of city streets is still under discussion. Messrs. A. P. Tukey, Alvin Saunders, A. L. Reed, P. L. Perine and Cadet Taylor have been appointed a committee to confer with committees of the Commercial Club and the City Council, as to the most advisable means of bringing the question of repaving to a solution.

Indianapolis, Ind.—Final action was taken by the Board of Public Works Sept. 26 on the following: Cement sidewalks in Arsenal avenue; improving roadway of Singleton street; cement walk on north side of Ohio street, from Arsenal avenue to Hanna street. The property-owners on Indiana avenue have been urging the paving of that thoroughfare, from West street to Fall Creek.

Jersey City, N. J.—Mercer street will be paved with asphalt at an expense of about $60,000. The street was paved with Belgian block two years ago at an expense of $50,000. Property-owners regard it as a willful waste of money to cover the blocks with asphalt, and have suggested that the Belgian block on Mercer street be taken up and used in parts of the city where the streets are paved with cobble-stones, and remove the cobble-stones from these streets for use as a foundation for the proposed asphalt paving in Mercer street.

Chicago, Ill.—Mayor Swift is opposed to repealing the measure providing for an asphalt pavement on Milwaukee avenue. The residents of Wells street want the ordinance for cedar block paving in that thoroughfare repealed also. They will consider the advisability of a more enduring material, either asphalt or granite. A recent rain storm damaged the city's streets to the extent of about $25,000. The most important streets damaged were Washington, from Canal to Desplaines; W. Madison, from Paulina to California; Cottage Grove avenue, from Twenty-second to Thirty-ninth; N. Clark street, in front of Lincoln Park.

CONTRACTS TO BE LET.

Mt. Vernon, N. Y.—Bids will be received until Oct. 6 for macadamizing two streets. George M. Jenkins, City Clerk.

Richmond, Ind.—Bids are invited until Oct. 12 for improving North D street. J. H. Winder, Clerk B. P. I.

Buffalo, N. Y.—Sealed proposals will be received until Oct. 7 for asphalt paving. R. G. Parsons, Secretary D. P. W.

Martinez, Cal.—Bids will be received until Oct. 5 for building a road more than a mile long. F. L. Glass, County Clerk.

Merchantville, N. J.—Sealed proposals will be received until Oct. 6 for macadamizing with stone or broken slag about 1,500 feet of Center street. Certified check or cash deposit, $300. Frank S. Walton, Chairman.

Haughville, Ind.—Sealed proposals will be received until Oct. 9 for cement sidewalks. Certified check, $100. Thomas Wiles, Clerk.

Great Falls, Mont.—Bids will be received until Oct. 2 for grading 995 feet of Riceville road. L. M. McDonnell, County Clerk.

Stapleton (L. I.), N. Y.—Bids are invited until Oct. 22 for improving certain roads. Henry P. Morrison, Engineer County roads.

Charleston, Ill.—Sealed proposals will be received until Oct. 1 for 2,500 square yards of brick paving. Percy Johns, City Clerk.

Cincinnati, O.—Sealed proposals will be received until Oct. 19 for paving Carll avenue with brick. August Herrman, President B. of A.

Hammond, Ind.—Sealed proposals will be received until Oct. 13 for macadamizing 6,300 feet of Calumet avenue. W. F. Bridge, City Civil Engineer.

Salem, O.—Sealed bids will be received until Oct. 20 for paving Garfield avenue with brick. Certified check, $500. F. W. Allison, City Clerk.

Winona, Minn.—Bids are invited until Oct. 5, for constructing a stone sidewalk on Third and Walnut streets. Check, $100. L. D. Frost, Recorder.

Cleveland, O.—Sealed proposals will be received until Oct. 14 for grading the Brecksville road. Bond, $1,000. Julius C. Dorn, Clerk Board of County Commissioners.

South Bend, Ind.—Sealed proposals will be received until Oct. 12 for curbing and paving certain sidewalks with cement. L. A. Hull, City Clerk.

Rochester, N. Y.—Sealed proposals are invited until Oct. 2 for asphalt paving in Exchange Place and for cement sidewalks in three streets. Thomas J. Neville, Clerk Executive Board.

Binghampton, N. Y.—(Special.)—H Ward says that the City Clerk has been ordered to advertise for bids for extending the asphalt pavement on Main street to Jarvis street.

Toledo, O.—Sealed proposals will be received until Oct. 19 for paving Frankli avenue with Trinidad or Bermudez asphalt, cedar blocks, blocks or brick. Deposit, $500. Lem P. Harris, City Clerk.

Portland, Ind.—Sealed proposals will be received until Oct. 5 for grading and graveling W. Main street, from Park street to the corporation line. Certified check, $100. A. J. Frost, City Civil Engineer.

Richmond, Ind.—Sealed proposals will be received until Oct. 2 for stone curb and brick gutters and cement curb and gutters. Bond, $500. Each bid by foreign contractors must be accompanied by a certified check for $100. Joseph H. Winder, Clerk of Board of Public Improvement.

Boston, Mass.—Sealed bids will be received until Oct. 6 for building section 8, two track sub-way, in Hanover street between Court and Washington streets. The work includes 3,000 cubic yards of concrete and brick masonry. Certified check, $2,000. B. Leighton Beal, Secretary Boston Transit Company.

Niles, O.—(Special.)—Sealed proposals will be received until Oct. 15 for grading, paving and curbing Main street, from Park avenue to Mahoning river, with asphalt block or paving brick or block. Certified check, $500. Bids will also be received until Oct. 17 for the purchase of eleven 6 per cent. bonds of $1,000 each. Certified check, $100. John L. McDermott, City Clerk.

Cincinnati, O.—Sealed proposals will be received until Oct. 5 and 6 for paving several alleys with brick; until Oct. 7 for paving Wesley avenue with asphalt blocks; with asphalt, Moore and McMillan streets and Pullan avenue; until Oct. 8 for paving Clay, Lippincott and Green streets with asphalt, and Charles street with brick. August Herrman, President Board of Aldermen.

CONTRACTS AWARDED.

West Superior, Wis.—The contract for paving N. Eighteenth street was awarded to James Burke for $6,661.

Louisville, Ky.—Brick paving contracts were awarded, Sept. 22, to Lee Figg and Jacob Shuster.

Duluth, Minn.—The lowest bid for building the Miller Trunk Line road was presented by P. McDonnell, $63,500.

Marquette, Mich.—The contract for improving Fourth street was awarded to Larochelle & Largeness at $1.18 a lineal foot.

Webster City, Ia.—The Lehigh Brick and Tile Company has the contract for furnishing brick for the paving work in Dubuque.

Cleveland, O.—The contract for improving the Doan Brook Parkway was awarded to Cowley & O'Brien for about $35,000.

Marion, O.—The contract for paving N. Main street was awarded to Kelly & Company of this city for about $20,000.

Richmond, Ind.—Chris. Burkhardt was awarded the contract for stone curb and brick gutters on Main street at $1.38 a lineal foot.

Media, Pa.—The contract for repairing Monroe street with stone was awarded, Sept. 15, to Johnson & Wickersham at $1.45 a ton.

Glastonbury, Conn.—C. B. Cadwell, of New Britain, secured the contract for the macadam road to Addison at $1.08 a lineal foot.

Washington, D. C.—The contract for replacing the asphalt block pavement on Maryland avenue, between Seventh and Thirteenth streets, northeast, was awarded to the Washington Asphalt Block and Tile Company.

Omaha, Neb.—Van Court & Winn secured the contract for grading the Thirteenth street boulevard at 7¼ cents a cubic yard, Aug. 27.

Decatur, Ill.—V. H. Parke & Son received the contract for curbing N. Water street, from Main to Herkimer, at 30 cents a running foot.

East St. Louis, Ill.—The contract for paving Collinsville avenue was awarded to Anderson & Co. of St. Louis, Mo., for $23,338.

Chicago, Ill.—The contract for repaving W. Jackson street with asphalt has been awarded to the Western Paving and Supply Company.

Cohoes, N. Y.—Prescott Hildreth secured the contract for paving the alley of the new City Hall and laying the sidewalks for $3,036.40.

Detroit, Mich.—The contract for paving Mullett street with brick on concrete was awarded to Sheehan & Company for $16,288.

Cleveland, O.—M. F. Bramley was awarded the contract Sept. 2 for paving three miles of the new South Woodland road with brick for $33,372.

Denver, Col.—The Colorado paving Company has been awarded the contract for grading and curbing District No. 2, on East Capitol Hill, for $12,000.

Boston, Mass.—Andrew Carberry of East Walpole secured the contract for constructing 3,000 feet of road in the Middlesex Falls reservation for $2,978.

Niagara Falls, N. Y.—The Barber asphalt Paving Company was awarded the contract for 825 square yards of asphalt paving at $2.50 a square yard, or $2,182.50.

Troy, N. Y.—The contract for paving Fulton street, from Sixth to Seventh, with Mack fire brick, was awarded to John J. Mooney, Sept. 15, for $2,898.

Sheboygan, Wis.—The contract for paving was awarded to J. H. Green & Sons of Appleton at 61½ cents for paving and 34½ cents for curbing.

Keokuk, Ia.—Cameron, McManus & Tucker have been awarded the contract for macadamizing 6,000 feet of the Keokuk & Charleston road for $5,600.

Davenport, Ia.—Boland & Andrews were awarded contracts Sept. 19 for three pieces of macadamizing at $1.22, 66 cents and $1.10 a square yard, respectively.

Alton, Ill.—The contract for paving the City Hall square and Market and Piasa streets with brick was awarded Sept. 7 to Job & Company at $1.19 a square yard.

Doylestown, Pa.—Thomas Cunningham of Philadelphia has closed a contract with the Shelby Co-operative Association for 300,000 Belgian blocks for city street paving.

Portland, Ore.—The paving committee has recommended that the contract for brick paving on a concrete foundation be awarded to Hamilton & Sweeney at their bid of $5,347.

Galesburg, Ill.—J. B. McAuley was the only bidder for paving W. South and E. North streets with brick. His bid for W. South street was $8,550.75, and for E. North, $4,034.

Williamsport, Pa.—D. P. Guise was awarded the contract, Sept. 7, for repaving Market street, from the pavement at the P. & A. railroad to the P. & E. railroad at 93 cents a square yard.

Boston, Mass.—Shailer, Schniglau & Company of Chicago secured the contract for constructing section 10 of the subway, at a total cost of $77,420. The bid is considered remarkably low.

Southington, Conn.—Robert Fenton of Willimantic secured the contract for macadamizing the road on the Plainville line as follows: Section 1, $1.29 a lineal foot; section 2, $1.34 a lineal foot.

Pittsburg, Pa.—Geo. L. Peabody was the only bidder, Sept. 7, for paving the front of No. 26 engine house. His bids were, asphalt, $2.75 a square yard; granolithic, $1.80; curb, 65 cents a foot.

Old Saybrook, Conn.—The bids received, Sept. 19, for constructing a macadam road ranged in price from 69 2-3 cents to $1.01 a lineal foot. A. Brazos & Sons. of Middletown presented the lowest bid.

Stamford, Conn.—J. E. Miles & Co., Easton, Pa., has been awarded the contract for paving a section of Main street with McMahon, Porter & Co. brick at $2.16 a square yard, five year guarantee.

Long Islard City, R. I.—Thos. J. McKenna of Flushing was awarded the contract, Sept. 10, for macadamizing the Flushing and Astoria road for $30,179.75, and the Rocky Hill road for $41,914.40.

Ft. Wayne, Ind.—The contract for paving Leith street, from Calhoun street to Hoagland avenue with brick, was awarded to Wilhelm & Porter at $1.05 a square yard.

New Haven, Conn.—The contracts for paving Ashmun and Wooster streets with brick have been awarded to J. E. Miles & Co. of Easton, Pa., at $1.92 a square yard, five year guarantee. Mack brick will be used.

Grand Rapids, Mich.—(Special.)—H. A. Collar says that contracts have been awarded as follows: Grading and graveling Waterloo street, J. Drieborg, $4,295.55; macadamizing Coldbrook street, A. C. Sekell, $1,944.

Kansas City, Mo.—The Barber Asphalt Paving Company was awarded the contract, Sept. 3, for paving with asphalt Eighth street, from Lydia avenue to Woodland at $2.15 and Lawton place at $2.12 a square yard.

Salt Lake City, Utah—Bids were received Aug. 22 for paving Second South street, between W. Temple and First West streets. The contract was awarded to A. F. Hobson at the following prices: Grading 2,700 cubic yards, 50 cents; curbing, 1,120 lineal feet, $1.25; sandstone block paving, 1,500 square yards, $2.94; asphaltic sandstone, 3,900 square yards, $2.74; crosswalk, 120 square feet, 64 cents; gutter, 70 lineal feet, $2.60.

Ashtabula, O.—Bids were received recently for 58,000 square yards of brick paving as follows: Ashtabula Construction Company at $8,157; S. H. & C. R. DeGroodt, Youngstown, $7,771; E. R. Pulman, $7,000.

Cumberland, Md.—The County Commissioners awarded the contract, Sept. 22, for furnishing 75,000 bricks for paving a portion of Washington and Prospect streets to Thomas Maxwell of Williams Station, Pa., at $10 per thousand.

New Haven, Conn.—The contract for paving East street, from Water to Bridge, was awarded, Sept. 23, to Conner Bros. & Co. at $1.27 a square yard. The only competitor for the work was C. W. Blakeslee & Sons, who bid $1.39.

Paterson, N. J.—Colfax & Steele secured the contract, Sept. 8, for repairing two and a half miles of the Godwinville road at $1.75 a cubic yard for supplying broken stone or screenings, or $1.85 for material and repairing the road.

Alexandria, Ind.—The contracts for grading, curbing and paving Harrison street was awarded to Peters, Sullivan & Runyan of this city at $1.46 a square yard for brick paving, 47 cents for 5x24-inch and 75 cents for brick sidewalks.

New Haven, Conn.—The committee on streets is unanimous in the recommendation of Mack wire-cut brick for paving Wooster and Ashmun streets. J. E. Miles, who has the contract, has commenced work and will endeavor to have the pavement completed by Dec. 1.

Wilmington, Del.—Contracts for furnishing screenings and crushed stone were awarded, Sept. 1, as follows: Screenings, Brandywine Granite Company, $1 a cubic yard; stone, John T. Dyer Company, $1.20 for one and one-half-inch stone and $1.03 for three-inch stone.

Groton, Conn.—H. L. Ladd of Norwich was the lowest bidder, Sept. 9, for a new macadam road in West Mystic at 95 cents for native stone, $1.20 for native stone and blue stone screenings and $1.40 for half native stone and half trap rock.

Newark, N. J.—John F. Shanley was awarded the contract, Sept. 10, for paving Holland street, from Springfield avenue to S. Tenth street, with asphalt for $11,094.

Allegheny, Pa.—The contract for grading Wilson avenue was awarded, Sept. 11, to Booth & Flinn for $9,112.50; for grading, paving and curbing Summit avenue, A. V. Purnell, for $4,439; grading and paving Gang alley, Joseph Hastings, $850.

Columbus, O.—Paving contracts were awarded Sept. 15 as follows: Warren-Scharf Asphalt Paving Company—Cleveland avenue, asphalt, $4,520.30. John Keller—Richard avenue, from Broad to Town street, $1,267.50; Glenn alley, from Buttles avenue to Russell street, second-class Wassail block on crushed gravel foundation and sand filling, $1,126.85.

Council Bluffs, Ia.—The contract for paving First street was awarded to E. A. Wickham of Des Moines at $1.38 a square yard, for Des Moines side cut repressed brick. J. J. Hughes of Des Moines bid $1.36¾, without specifying any particular brick.

Milwaukee, Wis.—The contracts for paving Fifth street, from Cedar to Vliet, with cedar blocks and stone curbing, was awarded to John O. Jones at 98½ cents a square yard for paving; 38½ cents a lineal foot for curbing and 7½ cents for resetting old curbing.

Springfield, Mass.—The contract for paving South Main street with vitrified brick was awarded Sept. 19 to Robert Maynard of this city at 84 cents a square yard, which price only covers the laying of the concrete base and laying the brick, which will be furnished by the city.

Hagerstown, Md.—The contract for paving Jonathan street, between Washington and Antietam, was awarded Sept. 22 to E. G. Buck at $1.43 a square yard for that portion in which sand filling is to be used, and $1.50 where cement filling is to be used. McMahan & Porter brick will be used.

Sioux City, Ia.—The contract for paving Douglas street with asphalt was awarded to the Barber Asphalt Company at $2.37 a square yard. Bids for brick paving for this street were received as follows: W. C. McNamara & Co., $1.79 a square yard; M. L. Flinn, $1.85; Hanlon & Knepper, $1.80.

New Castle, Pa.—The contract for macadamizing Jefferson and Mercer streets was awarded Sept. 14 to McIlwaine & Ott Bros. at the following prices: Excavation, 30 cents a cubic yard; curb, 37 cents a lineal foot; No. 1 block, $1.65 a square yard; No. 2 block, $1.17; macadam, 85 cents; tile, 8 cents.

Cleveland, O.—The contract for draining and improving Doan Brook Parkway was awarded to Cowley & O'Brien for $3,525, and for constructing foot walks and roads along Doan Brook parkway to Burgess & Gribben for $9,528. The bids for improvements in Newbury Park were rejected as being too high.

Battle Creek, Mich.—(Special.)—John Elsmere, city engineer, says the contract for paving 5,600 square yards of Main street with brick on concrete foundation was awarded to John J. Granville of Saginaw, Mich., at $1.37 a square yard, with five years' guaranty, and 25 cents a cubic yard for excavation. Saginew brick will be used.

Evanston, O.—The contract for paving Brewster and Hudson avenues with brick, bids for which were received Aug. 8, was awarded to Richard Block, Aurora, Ind., at the following prices: Excavation, 21 cents a cubic yard; concrete, $2.45 a cubic yard; steam rolling, 3 cents a square yard; brick paving, sand joints, 74 cents a square yard; brick paving, tar joints, 79 cents a square yard; resetting old curb, 10 cents a lineal foot; resetting old gutter, 10 cents a lineal foot; new stone curb, 44 cents a lineal foot; new stone gutter, 42 cents a lineal foot; catch basins, $25 each; total, $5,214.

Brooklyn, N. Y.—Contracts for the extension of the Eastern parkway were awarded Sept. 22 as follows: First section, 3,000 feet, Thomas F. Byrnes, $58,-118; second section, 3,500 feet long, including a viaduct, Michael J. Dady, $170,725. When specifications have been completed the section between Rockway and Bushwick avenues will be let.

Evansville, Ind.—James Carter & Company secured the contract for improving the alley between Delaware and Columbia streets at 38 cents a lineal foot, and $18 for manholes and $1.25 for Ys. Bedford, Weikel & Nugent was awarded the contract for paving Illinois street and Third avenue with Morris & Lant brick at $1.34½ a square yard.

Detroit, Mich.—Paving contracts were awarded, Aug. 26, as follows: Block brick on concrete, Wright street, from Walker to Mt. Elliott avenue, Lennane Bros., $9,240.37; Mullett street, from Raynor to Dequindre, Sheehan & Co., $16,288.01; cedar blocks on concrete, Hamlin avenue, from Beaubien street to Oakland avenue, H. Merdian & Co., $2,823.21.

Milwaukee, Wis.—E. E. Naugle, of Chicago, was awarded three contracts for cedar block paving in this city, Sept. 10, at 85 cents, 93 cents and $1.02 a square yard for paving and 30 cents and 33 cents a lineal foot for curbing. William Forrestal was awarded one contract at 97 cents for paving and 45 cents for curbing. William Gutnecht will grade, curb and pave Twelfth avenue.

Detroit, Mich.—J. H. Talbot was awarded the contract Sept. 3 for paving Jefferson avenue, from Crane avenue to the eastern city limits, with cedar blocks on concrete, for $18,223.50. Other contracts awarded for cedar block paving were Hazlewood avenue, Thomas Currie, $3,558.27; Selden avenue, from Lincoln to Commonwealth avenue, Michigan Stone and Supply Company, $2,718.62.

Buffalo, N. Y.—The lowest bids received Sept. 11 for paving a number of streets were: For Troupe street, brick, $5,500; asphalt, $5,600; paving Plymouth avenue, brick, $1,400; asphalt, $1,450; Rano street, brick, $5,000; asphalt, $5,500; resurfacing Station alley, asphalt, $300; paving South Division street, asphalt, $6,400; brick, $6,000. These bids were by the Standard Paving Company.

Milwaukee, Wis.—The Western Paving and Supply Company secured the contract Sept. 11 for paving Third street, from W. Water to Everett, 11,385 square yards, with asphalt at $2.29½ a square yard. A private contract was awarded to the Western Paving and Supply Company Sept. 8 by the owners of the Cummings tract, for paving with asphalt on a concrete foundation, Prospect, Farwell and Stowell places, at $2.06 a square yard. William Forrestal was awarded the contract Sept. 14 for one block of brick paving on Biddle street at $1.89 a square yard. The other bids received for

this work were: George J. Markey, $1.98; James O'Donnell, $2; ogt Fuel and Construction Company, $2.03.

Trenton, N. J.—The bids received about Sept. 1 for paving Hamilton avenue, were as follows: California Asphalt Company, Alcatraz, $2.48 a square yard; J. A. M. Matthews, Texas rock, $2.50; C. B. Walton, Trinidad, $2.56; George E. Fell, French, $2.48; W. F. McGovern, Bermudez, $2.53; California, $2.42; Trinidad, $2.33; Sicilian, $2.28; Texas, $2.19; R. A. Montgomery, any kind, $2.47; Vulcanite Paving Company, Trinidad, $2.60; S. H. Taylor, Trinidad, $2.19; Richardson & Ross, Trinidad, $2.69. The contract for paving Prospect street with Mack brick was awarded to Dennis Roe at $2.11 a square yard, and Pennington avenue to W. F. McGovern.

Altoona, Pa.—(Special.)—Harvey Linton, City Engineer, says that the contract was awarded Sept. 12 to Leamer Bros. for about 943 square yards of vitrified brick paving on six-inch concrete foundation, with Portland cement grouting and fine glass sand, at $1.68 a square yard. The street commissioner's force will do the excavating at an estimated cost of 21 cents a square yard. The City Passenger Railway Company will lay 208 square yards of paving on six-inch concrete between the street-railway tracks. The work will be done under the supervision of Mr. Linton. The owners of property abutting on Union avenue, between Eighteenth and Nineteenth streets, have unanimously agreed to pay for the paving of that street from the completed pavement on Eighteenth street to the center of Nineteenth street, a distance of 375 feet. The paving on Washington avenue, the character of which is similar to that on Union avenue, is progressing satisfactorily. The contract price for the work is $2.10 a square yard. W. L. Pennock is the contractor and brick manufactured by the Clearfield Clay Manufacturing Company, Clearfield, Pa., is being used. The glass sand used in the paving work is obtained from Mapleton, Pa., and other quarries and is graded as No. 2.

SEWERS.

Newark, N. J.—The answers received from the bottles set adrift recently by the Passaic Valley Sewerage Commission to determine the trend of currents in the Neward Bay would indicate that the tides at ebb carry refuse out through the Kill Von Kull and Staten Island Sound. It is not thought practicable to establish the outlet of the proposed sewer in any part of the Bay, as the nuisance would merely be transferred from the banks of the Passaic to the Bay. The immediate prospect is to dispose of the sewage of Paterson and Passaic by building a trunk sewer from Paterson to Newark Bay, with branches crossing under the river from Rutherford, Arlington and other towns on the east bank. This would form an intercepting sewer from Newark and keep all but the surface drainage out of the river. Modifications of this plan to keep back solids in settling basins and let only the liquids and storm water into the river will probably be reported.

Stoneham, Mass.—A vote was recently taken on the proposed discontinuance of sewer construction in certain streets for which a sum of $130,000 had been set aside. The contractors who are constructing the sewers had given a verbal promise beforehand to waive all claims for damages on account of the discontinuance and it was on this action of the contractors that the vote of the town to discontinue the work rested. Much surprise was felt, however, when they demanded $2,500 "as anticipated profits" to discontinue operations on parts of sections 1, 2 and 3 of the sewer, as voted by the citizens at a previous special meeting. Neither the contractors nor the board of sewer commissioners are inclined to discuss the matter.

CONTEMPLATED WORK.

Chester, Pa.—A sewer will be built on E. Third street.

Los Angeles, Cal.—A sewer will be constructed in Council street.

Sharon Hill, Pa.—Plans are being made for a system of sewage.

Jamaica, N. Y.—Plans are being considered for draining the streets.

Gladbrook, Ia.—A sewer from block 6 to Wolf creek is contemplated.

Clayton, N. Y.—Plans have been made for a complete sewage system.

Harrison, N. J.—A brick sewer will be constructed in Harrison avenue.

Mankato, Minn.—The construction of a sewer on Clark street is urged.

Chino, Cal.—The question of constructing sewers is being discussed.

Lancaster, O.—The extension of the W. Wheeling street sewer is contemplated.

Gallipolis, O.—The question of building a sewerage system is being considered.

Pawtucket, R. I.—Sewers will be constructed in Woodlawn, a suburb of this city.

Walden, N. Y.—The construction of sewers is being considered by the Board of Trustees.

Whitestone, N. Y.—A sewer in one block of Eighteenth street is contemplated.

Mechanic Falls, Me.—The construction of a better sewerage system is contemplated.

London, Ont.—This city voted to expend $200,000 in perfecting the sewerage system.

Little Falls, Minn.—The City Engineer has been instructed to furnish specifications for a sewer.

Webster City, Ia.—Estimates for a sewerage system are being made by C. E. Fox of Chicago.

Los Angeles, Cal.—An ordinance of intention to construct a sewer on Council street will be passed.

Olivia, Minn.—P. W. Heins contemplates putting in sewerage from his building to the creek.

Clinton, Ia.—A ten-inch sewer is contemplated for the alley in block 28. F. M. Gobble, Mayor.

La Grange, Ga.—The construction of a sewerage system is contemplated. R. Dallis, City Engineer.

North Adams, Mass.—The City Council has voted to expend $15,000 on a surface sewerage system.

Pittsfield, Mass.—An appropriation will be asked for a new sewer to replace old wooden sewers.

Spokane, Wash.—The improvement of the sewerage system in the Third ward is being considered.

Glenville, O.—Sewers are contemplated for John, Eldridge, Avondale and other streets.

Lawrence, Mass.—Sewer construction and other improvements in the Fifth ward are contemplated.

Terre Haute, Ind.—The plans for the proposed belt sewer are being considered.

Hillsdale, Mich.—A 6-inch sewer will be constructed on Manning street, from Barry to Bacon.

Mt. Vernon, O.—The construction of sewers is contemplated by the council. A. Cassil, City Engineer.

Jersey City, N. J.—A new sewer to drain the Heights district is being considered by the Commissioners.

Topeka, Kas.—Sewerage is being urged for North Topeka by the residents of that part of the city.

Central Falls, R. I.—Sewer construction in two streets, at an estimated cost of $6,200, is proposed.

Covington, Ky.—The Board of Aldermen ordered a 15-inch sewer placed at Eighth and Dalton streets.

Springfield, Mass.—Sewers are contemplated for Cleveland, Lozier and Noble avenues and on E. Silver street.

Middletown, O.—An ordinance has been passed for the construction of a trunk sewer. J. V. Bonnell, Clerk.

Greensburg, Ind.—An estimate of the probable cost of a sewerage system is being made by Geo. C. Stevens.

Portsmouth, O.—The subject of a sanitary sewerage system is becoming a vital question in this city.

Wilmington, Del.—Estimates will be made of the cost of a sewer on Tatnall street, between Ninth and Tenth.

Warren, R. I.—The plans for a system of sewerage have been completed by Chas. P. Chase and placed on file.

New Canaan, Conn.—Recommendations for a sewerage system have been submitted by Waring, Chapman & Farquahar.

San Francisco, Cal.—The property-owners on portions of Brady, Stevenson and other streets have asked for sewers.

New Brunswick, N. J.—Bids will probably be asked soon for constructing a pipe sewer in the Third district.

Jamestown, N. Y.—The Board of Public Works estimates the cost of constructing sewers to the Cassadagua Creek at $46,826.

New Bedford, Mass.—The City Engineer has recommended the construction of sewers in Locust and Orchard streets.

Danbury, Conn.—Plans have been completed for improving the sewerage system; estimated cost, $15,000.

Webster City, Ia.—A preliminary survey for a sewerage system for this town has been completed by Edward E. Fox, Civil Engineer of Chicago.

Canton, Miss.—Plans are being prepared for a sewerage system for this city by Walter G. Kirkpatrick of Nashville Tenn.

McKeesport, Pa.—The sewer committee of councils has recommended a 20-inch sewer on Spring alley, from Walnut street to Ninth avenue.

Marietta, O.—A sewer will be constructed in Franklin street, from Lancaster street to the Ohio river. Car Beck, City Clerk.

Pawtucket, R. I.—Plans are being prepared by the City Engineer for sewers in the East avenue, Pleasant and Harvey street districts.

Norwich, Conn.—A new system of sewerage is contemplated for Eastern Point by the Eastern Point Improvement Society.

Elizabeth, N. J.—The plans for the proposed $125,000 trunk sewer in the bed of the Elizabeth river are generally approved.

Indianapolis, Ind.—Final action for construction of a local sewer in Charles street, from Ray to Sycamore, has been deferred.

Louisville, Ky.—Plans and specifications are being made by City Engineer Pearson for the construction of the proposed big sewer.

Portsmouth, N. H.—The special committee on sewer appropriation has recommended an appropriation of $10,000 for sewers. Chairman Tobey.

St. Albans, Vt.—The main outlet of the sewer will probably be extended about 5,000 feet this season. Charles E. Collins, City Engineer.

Framingham, Mass.—An appropriation of a sum of not less than $2,000 has been asked for the construction of a proper drainage system.

Honolulu, H. I.—Rudolph Hering, City Engineer, New York City, has been asked to visit this city and make a report on the proposed sewerage system. F. S. Dodge interested.

Quincy, Mass.—A report has been submitted for a sewerage system. The cost of the brick sewer of the system is estimated at about $70,000.

New Haven, Conn.—The committee on sewers recommended recently the construction of sewers in Shelton avenue and Fourth and Clay streets.

Dedham, Mass.—A petition will be made to the legislature for authority to elect sewer commissioners and to construct a sewerage system.

Woonsocket, R. I.—Ordinances have been approved by Mayor Green for sewers in a number of streets in the north end and in Pond street.

Peoria, Ill.—Press reports are to the effect that Peoria Heights will put in a sewerage system when the water works system is completed.

Passaic, N. J.—Ordinances were passed Sept. 22 for storm water sewers in Bloomfield and Lafayette avenues and High, Aspen, Monroe and other streets.

Patton, Pa.—Plans have been prepared by E. C. Brown, borough engineer, and adopted by the council, for sewers in portions of Bush and Fifth streets.

Keokuk, Ia.—An outlet is contemplated for the lumber districts of this city which overflow during heavy rains, owing to the lack of proper drainage.

Belmar, N. J.—This town will vote in October on the proposed construction of sewers and water works, plans for which are about completed. B. R. Richardson, Clerk.

Springfield, Mass.—Plans and specifications are being prepared for the extension of the Long Hill sewer into the middle of the river. Engineer Slocum.

Bath, N. Y.—The proposed construction of a sewer in Third street will, owing to some opposition to the plans, be taken before the State Board of Health.

New Castle, Pa.—The Common Council has adopted ordinances for the construction of lateral sewers in Grove street and Clearview and Croton avenues.

York, Pa.—The construction of a sewerage system is contemplated. Estimates were invited from civil engineers Sept. 20 for designs and preparation of plans.

Lyons, N. Y.—A board of sewer commissioners has been appointed composed of Daniel Moran, Saxon B. Gavitt, William Taylor, G. Henry Baltzel and Dr. Dwight S. Chamberlain.

Ocean Grove, N. J.—A report has been made on the proposed sewers for this city. John A. Githens, Washington White and Maxwell Crosbie compose the sewer committee.

South Bethlehem, Pa.—Borough Engineer Neumeyer has been instructed to secure the prices that competent engineers would ask to formulate plans for a sewerage system, and present them to the special committee of the town council.

Elizabeth, N. J.—Press reports state that a petition has been presented to council for a new trunk sewer from Westfield avenue to the sound; estimated cost, $120,000.

Scranton, Pa.—Ordinances for sewers on portions of Monsey, Sunset, Capouse and Wyoming avenues, and Birch, Beech, Maple and Elm streets, have passed first and second readings.

Bellevue, Pa.—The finance committee of the council recommends that an ordinance be prepared providing for a vote on the proposed issue of $35,000 in bonds to build sewers and grade streets.

San Jose, Cal.—An election will be called Oct. 31 to vote on issuing bonds for completing the main sewer a distance of 5,000 feet to drain into a slough near Alviso.

Sandy Hill, N. Y.—J. W. Burke, City Engineer, New York City, has been authorized to prepare plans and specifications for the proposed sewerage system. Orville Griffin, Chairman Committee.

South Orange, N. J.—The advisability of building a joint sewer to tidewater along the line of the Rahway river is being discussed. Philip H. Campbell, Chairman Sewerage Committee.

Cherokee, Ia.—(Special.)—Boynton & Wariner of Cedar Rapids have been engaged by this city to design a system of sanitary sewerage. About a mile of the system may be built this season.

Brooklyn, N. Y.—A resolution appropriating $25,000 for a relief sewer to be constructed on the extension of Clinton avenue to the Wallabout, has been recommended by the water and drainage committee.

Perry, Ia.—Petitions have been circulated for and against putting in more sewers and considerable interest is shown in the matter, but nothing definite will be decided upon until the council investigates the subject further.

Toledo, O.—Plans are on file at the City Clerk's office, Lem P. Harris, for a main sewer as an additional outlet for sewer No. 1 in Main sewer district No. 5, and for additional and better facilities for draining sewer district No. 5.

Michigan City, Ind.—An immense drainage system, embracing St. Joseph, Laporte, Lake, Porter, Newton and Jasper counties, is being formed to drain the Kankakee swamp region, which covers thousands of acres of what is now unproductice land.

Ottawa, Can.—A joint report on the proposed main drainage of the undrained portions of this city has been received from Chas. H. Kierfer of Ottawa and R. Adams Davey of Rievere du Loup Station, Quebec. Separate main drainage is proposed for the eastern and western portions of the city; the length of the western main sewer is 10,750 feet, and is from 7x4 feet oval section to 7-feet circular, including a rock tunnel 2,300 feet in length with excavation section of 6 feet, 6 inches; eastern main 2,300 feet in length, from 3 feet, 2 inches by 4 feet,

9 inches egg, to 7x4 feet oval section. A relief sewer, 5,500 feet long, with section 3x4 feet, 6 inches egg, to 3 feet, 4 inches by 5 feet egg, and tributary sewer 4,500 feet in length, with sections of four feet, 10 inches by 4 feet, 3 inches egg, to 4 feet, 2 inches by 3 inches egg shape, will be built; total estimated cost $411,075.

Hamburg, N. Y.—A sewer commission has been appointed consisting of Jacob Peffer, H. S. Spencer, George A. Bunting, J. H. Eno and J. W. Salisbury to visit several towns in Western New York and inspect sewer systems. The prospects for the contemplated system in this village are good.

Lynn, Mass.—Bids have been authorized by the Drainage Committee for sewer construction in Linden street and Western avenue. This sewer will complete all the branches and tributary sewers made necessary by the introduction of the Shone system in the River street district.

New York, N. Y.—The department of street improvements has completed plans for twenty miles of seventy-two to twelve-inch sewers in the district bounded by the Sound, the Harlem river and the boundary line of Westchester county prior to the annexation of Westchester. Williams Bridge, Wakefield and City Island.

CONTRACTS AWARDED.

Pittston, Pa.—The contract for a sewer in Cron street was awarded to Williamson & Wallace.

Cleveland, O.—J. Connelly & Son. secured the contract for constructing a sewer in Wilson avenue for $25,764.

Kingston, N. Y.—The contract for building sewers in Spring and Wirts streets was awarded to Maurice Murphy.

Windsor, Ont.—The contract for constructing a sewer in Giles avenue was let to Joseph Ferry for $6,796.

Akron, O.—The contract for a main trunk line sewer in South Akron has been awarded to McGowan & Hunt for $4,389.

Urbana, O.—The contract for building a sewer in Ward street has been awarded to James Sherlock for $3,047.

Albany, N. Y.—John Doyle secured the contract for constructing a 30-inch pipe sewer in Hamilton street for $3,578.

Hackensack, N. J.—The contract for constructing sewers was awarded Aug. 31 to Charles A. Sims of Philadelphia for $50,125.

Lead, S. D.—Andrew Rosewater, City Engineer Omaha, Neb., has about completed the plans for a sewerage system, and estimates the cost at $27,000.

Yeadon, Pa.—Ferdinand Bartilucci of Philadelphia was awarded the contract for laying a 24-inch sewer to tide-water for $25,300.

Baltimore, Md.—The contract for constructing the Beason street sewer was awarded Sept. 11 to P. Flanigan for $8,577.

Camden, N. J.—Aaron Ward secured the contract for building a sewer in Fifth street, from Bailey to Erie, at 79 cents a lineal foot.

Buffalo, N. Y.—John Mumm was awarded the contract Sept. 11 for constructing a sewer in East Delevan and Lang avenues for $31,749.

New Rochelle, N. Y.—The contract for constructing a sewer in Main street has been awarded to Peter Sweeney of Danbury, Conn., for $4,388.

Oxford, O.—Bids have been received for constructing a sewer from Miami University to Four Mile creek, but the contract has not yet been awarded.

Mason City, Ia.—The contract for constructing the Willow Creek sewer was awarded Sept. 28 to Ford & Dellahunt of Cedar Rapids for $21,370.

Marietta, O.—The T. B. Townsend Company, Zanesville, O., secured the contract recently for constructing seven miles of sewers for $14,000.

Sacrameto, Cal.—The contract for the construction of the South street sewage plant was awarded to J. W. McDonald of the City Street Improvement Company for $41,856.10.

Allegheny, Pa.—William J. Dunn of Pittsburg was awarded the contract Sept. 10 for a lateral sewer on Antrim street for $1,359.10, and on Linwood avenue for $3,000.50.

Kearney, N. J.—The contract for constructing a sewer in Devon street was awarded during September to Carlson & Company and for Stewart avenue to the Sargent & Company.

White Plains, N. Y.—The contract for sewers was awarded to Alex. and S. Traub at 58 cents and 63 cents a lineal foot for sewers and $26.50 and $27 for each manhole, $55 and $56.50 for each flush tank.

Toledo, O.—George E. Bodette was the lowest bidder Sept. 21 on four sewer contracts, at 75, 97 and 98 cents a lineal foot. F. E. Cole was the lowest bidder for a sewer in Missouri street at 90 cents a lineal foot.

Lancaster, Pa.—Frank Hinden was awarded the contract for constructing an 18-inch sewer on S. Queen street at 75 cents a lineal foot and for a 2-foot sewer on N. Prince street, from Lemon to James, at $1.05, and from Frederick to James at $1.25.

Williamsport, Pa.—J. H. Weitheroth was awarded the contract Sept. 3 for constructing the Washington street sewers for $1,845 and the Walnut street sewer for $2,053. Ward & Stucker of Harrisburg secured the contract for the Park street sewer for $2,518.

Toledo, O.—G. H. Cole secured the contract, Sept. 14, for a 2-foot brick sewer, 2,155 feet long, at 98 cents a lineal foot, and for one 523 feet long at 94 cents a lineal foot. James H. Horan was awarded the contract for 668 feet of 15-inch pipe sewer at 65 cents a lineal foot.

New York, N. Y.—Jones & Bronson have been awarded the contract to drain the valley of the Bronx river. The outlet, which will be at Farragut street and East river, will be 15½ feet in diameter. The contract awarded only covers about one-half of the proposed sewer. The estimated cost is $408,000.

Milwaukee, Wis.—John O'Donnell, the lowest bidder on the fourth section of the Thirtieth street sewer tunnel, has assigned his contract to John C. Crilley, who built section No. 3. M. Chybowski secured nine contract for sewers in different parts of the city at 94 cents to $1.22 a foot.

New Brunswick, N. J.—Lyons & Corrigan of this city secured the contract for constructing pipe sewers at the following prices: 18-inch pipe, $1.09 a lineal foot; 12-inch pipe, 94 cents; 20-inch pipe, $2.13; 12-inch pipe, 91 cents; manholes, 9 feet or under, $35.50; manholes, over 9 feet, $3.11; Y branches, 78 cents; total, $5,888.

Allegheny, Pa.—Sloan, McIlvaine & Ott were awarded the contract for a main sewer in Bell avenue and Lombard street, from Mead to Morris streets, as follows: 24-inch pipe sewer, 150 lineal feet, $2.40; 400 feet, 20-inch, $2; 360 feet, 18-inch, $1.33; 410 feet, 15-inch, $1.15; 1,100 feet, 9-inch, 70 cents; 10 No. 1 inlets, $40 each; 7 manhole shafts, $25 each; total, $3,455.

Fostoria, O.—Bids were received Sept. 21 for building a pumping station, a building for a garbage crematory, pumps, filter piers, etc., at sewage disposal works. Numerous bids were presented for different items of the proposed work, but only two bids were received for the work complete, and these were from local bidders. A. M. Fox bid $15,324, and H. Karg bid $21,614.

Bluffton, Ind.—The contract for constructing a sanitary sewer system sixteen miles in length, for which bids were received Sept. 5 as advertised in Municipal Engineering, has been awarded to Derheimer & Shanklin of Ft. Wayne, Ind., for $31,096.36. The contract for a system of storm water sewers, for which bids were received Sept. 14, was awarded to J. W. Wilding & Company of Ft. Wayne for $32,337.55.

Buffalo, N. Y.—Bids were received Sept. 11 for constructing sewers in Long and Colfax avenues as follows: Louis W. Miller, 1, $43,000; J. H. Franklin, 1, $34,700; John Harrer, 1, $31,900; 2, $2,590; C. A. Smith, 1, $33,700; 2, $3,460; George & Thomas Dark, Jr., 1, $39,750; Jacob Ritzmann, 1, $33,300; 2, $2,260; G. W. Moore, 1, $44,943; 2, $2,994; Hy. Harter, 1, $36,890; 2, $3,351; John Mumm, 1, $31,749; 2, $2,400; F. J. Martin, 2, $3,129; Andrew Beaser, 2. $2,224; W. A. Rappich, 2, $2,394; A. Kratzmann, 2, $2,929.

CONTRACTS TO BE LET.

Mt. Vernon, N. Y.—Sealed proposals will be received until Oct. 2 for constructing about 5,000 feet of open cement drains, and about 17,600 feet of tile drains, 2 to 36 inches in diameter. William C. Kellogg, Drainage Commissioner.

Mt. Vernon, N. Y.—Bids are invited until Oct. 6 for constructing a lateral sewer in Bridge street. George M. Jenkins, City Clerk.

Evansville, Ind.—Bids will be received until Oct. 3 for furnishing all sewer pipe required for sewer pipe repairs until Oct. 1, 1897.

Albany, N. Y.—Sealed proposals will be received until Oct. 5 for constructing a pipe sewer in Colonie street. Thomas J. Lanahan, Clerk.

Roselle, N. J.—Sealed proposals will be received until Oct. 2 for constructing 8,500 feet of eight to twelve-inch pipe sewer. G. A. Rawlins, Borough Clerk.

Hammond, Ind.—Sealed proposals will be received until Oct. 13 for an eighteen-inch tile sewer in Doty street, with house drains. W. F. Bridge, City Civil Engineer.

Toledo, O.—Sealed proposals will be received until Oct. 5 for constructing cylindrical brick sewers in certain streets. Deposit, $100. Lemuel P. Harris, City Clerk.

Buffalo, N. Y.—Sealed proposals will be received until Oct. 6 for constructing a sewer in Woodland street, from Clinton to Anderson. C. Edward Murray, City Clerk.

Mexico, Mex.—Proposals are asked until Nov. 14 for pumping machinery for the new drainage system. Address Mexican Consulate General, 35 Broadway, New York City.

Richmond, Ind.—Sealed proposals will be received until Oct. 2 for sewers in W. Main and W. Fifth streets. Bids of foreign contractors must be accompanied by check for $500. Joseph H. Winder, Clerk Board of Public Improvements.

Peoria, Ill.—Sealed bids will be received until Oct. 20 for improving a portion of the old channel and the construction of a new channel for Farm Creek. The channel will be 10,000 feet long, 50 feet wide, and from 4 to 7 feet deep. Certified check $1,000. Jacob A. Harmon, Engineer; John Keil, President Board Trustees.

WATER-WORKS.

Duluth, Minn.—The water and gas plants have been offered to the city for $1,695,000.

Peoria, Ill.—The mortgage for the $1,429,000 bonds on the water works plant will be foreclosed and the plant sold.

Watertown, Wis.—This city will purchase the water works plant, which was recently completed, for about $107,335.90.

Pittsburg, Pa.—The cost of the additional land to be purchased for city reservoir purposes wil lcost about $190,000, which will make the total cost of the land about $380,000.

Louisville, Ky.—Mayor Todd has proposed to sell the water works plant for $8,000,000 and with the proceeds pay off the city's debt. The plan will be bitterly resisted by the people.

Buffalo, N. Y.—The special investigating committee appointed to look into the matter of a new site for a water intake estimates the cost of bringing water from Stony Point at $7,000.

Des Moines, Ia.—A permanent injunction has been filed against the water company to restrain it from discriminating between its customers relative to water meters and rates. The trouble is said to have grown out of the company's attempt to compel meter consumers to make a deposit.

Brooklyn, N. Y.—An appropriation of over $500,000 for the water supply will be made. The board of aldermen has appropriated $311,000 for the usual maintenance of the system; $150,000 for diverting Horsebrook stream from Hempstead reservoir; $75,000 for the purchase of ponds near Springfield and for cleaning the ponds and streams now in use in the water supply.

CONTRACTS TO BE LET.

Ashland, O.—Sealed proposals will be received until Oct. 6 for constructing a reservoir. N. Strauss, Secretary Water Works Trustees.

Chicago, Ill.—Bids have been authorized for the extension of the intake tunnel of the new Northwest Land Tunnel. Joseph Downey, Commissioner Public Works.

St. Louis, Mo.—Bids will be received until Oct. 6 for laying 7,800 feet of 36-inch and 15,100 feet of 30-inch pipe. Robert E. McMath, President Board Public Improvements.

Bennett, Pa.—Bids will be received until Oct. 6 for furnishing and installing a horizontal pump of 2,000,000 gallons daily capacity. C. W. Dankmeyer, Borough Clerk.

Kansas City, Mo.—Sealed proposals will be received until Oct. 17 for the construction, erection and testing of a pumping engine at Turkey Creek station. Certified check $1,000. R. M. Godfrey, Secretary Board Public Works.

Evansville, Ind.—Sealed proposals will be received until Oct. 15 for furnishing 1,215 tons of 30-inch water pipe and specials. Deposit or certified check $2,000. D. Kronenberger, Member Water Works Trustees.

Pueblo, Col.—Bids will be received until Oct. 20 for putting in a foundation at the reservoirs for a new pump and boilers; for furnishing and laying pipe ;for the construction of an additional reservoir. Certified check, $2,000. Chairman Water Works Trustees.

Chicago, Ill.—Sealed proposals will be received until Nov. 14 for three vertical condensing triple expansion engines of 20,000,000 gallons capacity at Central Park pumping station. Certified check, $25,000. Also for three vertical condensing triple expansion engines of 20,000,000 gallons capacity at Pacifice Junction pumping station. Certified check, $25,000. Joseph Downey, Commissioner Public Works.

Boston, Mass.—Sealed proposals will be received until Oct. 6 for three separate contracts for laying iron water pipes as follows: 7,330 feet of 30-inch pipe in Malden; 10,000 feet 16-inch pipe in Revere; 14,400 feet 20-inch pipe in Malden and Medford. William N. Davenport, Secretary Metropolitan Water Board.

CONTRACTS AWARDED.

Dows, Ia.—Jackson & Moss of Des Moines secured the contract for the water works system for $4,749.

Vail, Ia.—The contract for the water works system was awarded to E. P. Egan of Nebraska City, Neb., for $3,300.

Dansville, N. Y.—The contract for the water works system was awarded to W. B. Wilson of Buffalo for $53,432.

Coraopolis, Pa.—The contract for constructing water works was awarded to Chandley Bros. & Co. of Beaver Falls for $24,698.

Duluth, Minn.—The contract for the riveted steel pipe for the force main of the new water works system was awarded to N. F. Hugo for $117,360.

Aurora, Ill.—Bids were received recently for a pumping engine for the water works from eight companies, and each company presented several bids, the prices ranging from $11,200 to $47,050. The Board of Public Works decided to visit several cities to see some of the engines at work before awarding the contract.

CONTEMPLATED WORK.

Staunton, Va.—The Council has authorized the purchase of a new boiler.

Parrsboro, N. S.—Plans for a water works system are being prepared by Prof. Butler.

Juniata, Pa.—Plans for water works are being prepared by S. C. Gorson of Altoona, Pa.

Cambridge, Mass.—The purchase of a 20,000,000 gallon pumping engine is contemplated.

Clayton, N. Y.—The question of water works and sewers has been voted for. Plans have been made.

Kingston, Mass.—The question of an additional water supply is being considered. W. S. Cole, Chairman.

Bridgewater, N. Y.—Preliminary surveys for water works are being made by E. F. Musson of Norwich.

Baldwin, Wis.—Bids will be received for constructing water works as soon as the plans are completed.

Pepin, Wis.—A petition has been circulated and a committee appointed to construct water works.

Brantley, Ala.—The plans for the proposed water works system have not yet been prepared. D. M. Payne, City Clerk.

Bolivar, N. Y.—A company is being organized to build water works. The question of municipal water works was defeated recently.

Deansboro, N. Y.—The Deansboro Water Company has been incorporated to construct a system of water works.

Charlotte, N. C.—The question of purchasing the water works and enlarging and improving the system is being considered.

White Sulphur Springs Mont.—Estimates of the cost of water supply will be prepared by M. S. Parker of Great Falls.

Wyandotte, Mich.—The purchase of two new boilers, 66x14, is contemplated. The meter system will probably be introduced also.

Philadelphia, Pa.—Albert E. Hazen, City Engineer, proposes a plan of sand filtration of the water supply at an expenditure of $3,400,000.

Brooklyn, N. Y.—The Aldermanic Committee approves the special expenditure of $25,000 for the purpose of improving the water supply.

Norfolk, Va.—Superintendent Riddle of the water board will probabaly visit Massachusetts to investigate the question of filtration.

The question of constructing water works has been favorably voted on at the following places: Sidney, Ia.; Sonoma, Cal.; Santa Barbara, Cal.

Dubois, Pa.—The Water Committee has been authorized to employ an engineer to assist in ascertaining the worth of the water company's plant.

Watervliet, N. Y.—The water board has decided to have water taken from several places in the Upper Hudson and analyzed by a competent chemist.

Waterloo, Ill.—It is probable that the construction of water works will begin this fall. Plans were prepared by Hiram Phillips, Civil Engineer of St. Louis.

Harrisburg, Pa.—An ordinance has passed first reading in select council appropriating $10,000 to extend the intake pipe further into the river.

Cincinnati, O.—The superintendent has been directed to submit a report as to the best means for supplying Winton place and Chester Park with water.

Washington, Call—J. H. Richardson, H. Wilson and Hugo Frommelt have been appointed commissioners to take steps towards constructing water works.

Beaver Falls, Pa.—The People's Water Company has been organized to construct water works by William Sloan, Mark Wisener, Sr, J. D. Perrott and others.

Rockford, Ill.—The plan of D. W. Mead for increasing the water supply of this city to 500,000 gallons a day at an expenditure of $40,000 has been recommended for adoption.

Alton, Ill.—The water company has, according to report, refused to put in a filter. The matter has been referred by the city council to a committee with power to act.

Dwight, Ill.—(Special.)—George A. Baker, Village Clerk, says that the water works question has only been talked of in board meetings and it is not probable that anything will be done this year.

Hiram, O.—New plans are being made for the proposed water works system, as the plans on which the bids were received Sept. 15 exceed the appropriation. New bids will be asked. E. C. Cooke, Engineer, Cleveland.

Dover, N. J.—A committee has been appointed to employ and engineer to investigate the question of municipal works. The present contract expires in November, 1897. Councilmen Mulligan, Young and Baker, Committee.

The construction of water works is contemplated at the following places: Deansboro, N. Y.; Athena, Ala.; Washington, La.; Jamestown, Cal.; Delta, Pa.; Marion, Ky.; Bentonville, Ark.; Okolona, Tenn.; Lanesborough, Mass.; Cloverport, Ky.; Stillwater, Okla.; Siloam Springs, Ark.; Redondo, Cal.

Coatesville Pa.—The water committee has been instructed to secure a competent engineer to draw specifications for repairing the reservoir and to advertise for bids for the same. A motion was adopted by the Borough Council Sept. 14, apppointing Messrs. Greenwood, Boyle and Barton a committee to ascertain the cost of securing water from Kurtz's dam.

Mount Vernon, N. Y.—John F. Fairchild, City Engineer, who was engaged to investigate the cost of piping water from the Byram river, on the Connecticut line, estimates that it will require an expenditure of $1,000,000. The Board of Water Commissioners has decided that the plan is not advisable, and is looking from some other source from which to increase the present supply.

BRIDGES.

Columbia, Miss.—A steel bridge is contemplated in this county.

Springfield, Mass.—Plans have been completed for the new Pomeroy bridge.

San Rafael, Cal.—Plans and specifications have been accepted for a concrete bridge.

Procterville, Mo.—A new bridge is proposed across Shoal Creek, east of this place.

Kansas City, Mo.—Plans have been prepared for a viaduct. Daniel O'Flaherty, County Surveyor.

Rantoul, Ill.—A 32-foot bridge, two miles from this city, in Hanwood township, is contemplated.

Pittsfield, N. H.—A steel superstructure will probably span the Suncook River at the Pittsfield Mills.

Fargo, N. D.—The construction of the Eighth street viaduct will probably again be brought to the notice of the council shortly.

Utica, N. Y.—Bids will be advertised for at once for an iron bridge on Whitesboro street, near Cedar.

Beardstown, Ill.—A new wagon bridge will probably be built across the Illinois River at this place.

Chattanooga, Tenn.—The question of rebuilding the Eleventh street bridge is being urged.

Vergennes, Vt.—A steel bridge from the east side of the river to the island is contemplated.

Goshen, Ind.—Frank Brumbaugh, Elkhart, Ind., secured the contract for the new river bridge near Oak Ridge cemetery for $10,150.

Foster, Ill.—The township committee has voted to build a sixty-five-foot and fifty-foot bridge in Drurie township. F. P. Gillett, Town Clerk.

Greenfield, Mass.—The selectmen report that two bridges will be required on the Plains road at a total cost of not less than $4,000.

Fall River, Mass.—The construction of a bridge in the park is being considered at a cost of $18,000. Philip D. Borden, City Engineer.

Woonsocket, R. I.—Plans are about completed for new bridge abutments for which $21,500 has been apropriated. Frank H. Mills, City Engineer.

Yankton, S. D.—Bids will be received until Oct. 5 for building a wagon bridge across the Dakota river. Herman Schaneat, County Auditor.

Kalama, Wash.—Bids will be received until Oct. 5 for a bridge across the Coweeman river, near Kelso. W. S. Lysons, Clerk Board of County Commissioners.

Houston, Tex.—Bids are invited until Oct. 12 for a bridge over Green Bayou on the Houston and Crosbie roads. John G. Todd, County Judge.

Sidney, Wash.—Bids are asked until Oct. 5 for constructing a six-hundred-foot trestle in section 15. Joseph Bitt, County Auditor.

Keosauqua, Ia.—An appropriation of $20,000 has been voted with which to erect a bridge across the Des Moines river between this city and Leando.

Hills, N. D.—The Wrought Iron Bridge Company, Canton, O., secured the contract Sept. 9 for constructing nine county bridges for $9,395.

North Milwaukee, Wis.—The construction of a bridge at a cost of about $4,000 is contemplated.

St. Paul, Minn.—Plans have been authorized for a bridge over the railway tracks at Raymond avenue.

Sonoma, Cal.—The City Clerk has been authorized to advertise for bids for building a new bridge at Fourth street.

Chicago, Ill.—The Northwestern avenue bridge is reported in bad condition and will have to be rebuilt at once.

Hastings, Pa.—The citizens of St. Augustin have asked the County Commissioners for a new bridge over Deep creek.

Duluth, Minn.—Sealed bids will be received until Oct. 6 for the construction of four bridges. O. Halden, County Auditor.

Meadville, Pa.—The erection of a county bridge over Oil creek at the foot of Bunn street is unanimously recommended.

New York, N. Y.—Plans have been prepared by M. A. Kellogg, Park Department, for an approach for the southern end of the Central bridge.

Marinette, Wis.—A resolution has been adopted to settle the bridge question between Menominee, Mich., and this city by arbitration.

Davenport, Ia.—Charles Francis, Engineer, has presented his report and plan for the construction of the Le Claire street viaduct.

Billings, Mont.—The construction of 150 ft. bridge over the Musselshell river is contemplated; estimated cost, $5,000. J. C. Bond, Commissioner.

Evansville, Ind.—An effort will be made to have the county commissioners rebuild or repair the bridge over Bee Slough, at Bayliss street.

Ft. Worth, Tex.—Bids will be received until Oct. 13 for the construction of an iron bridge across the Trinity river on Wheeler Mill road.

Big Timber, Mont.—Bids are asked until Oct. 8 for an iron and steel bridge over the Yellowstone river. J. W. Bailey, Chairman Board of County Commissioners.

Oregon, Ill.—The Board of Supervisors have agreed to appropriate $12,000 for the construction of a new steel wagon bridge across Rock river.

Ennis, Tex.—A wagon bridge is contemplated across the Trintity river at Red Bank. O. A. Finley, M. S. Rutherford and W. W. Cochran, Commissioners, Ennis.

Albany, N. Y.—The contract for constructing a bridge at the head of Otisco lake was awarded, Aug. 27, to Hughes Bros. for $8,318.

Gettysburg, S. D.—Bids will be received until Oct. 6 for constructing a bridge across the Little Cheyenne at Forest City. C. E. M. Oliver, County Auditor.

Denver, Col.—The City Engineer has been instructed to prepare plans and specifications for the new Fourteenth street viaduct, which will probably be built in 1897.

Binghampton, N. Y. — (Special.)—H. Ward says that no action has yet been taken in the matter of the Ferry street suspension bridge, which has been closed several months as unsafe for loaded teams.

Indianapolis, Ind.—Sealed bids will be received until Oct. 12 for the substructure of a bridge across White River at Harding street. Julius F. Reinecke, Member Board Commissioners.

Excelsior, Minn.—The citizens of this town have agreed to furnish approaches, if the County Commissioners will build a wagon bridge, across St. Alban's Bay, Lake Minnetonka.

Indianapolis, Ind.—A petition has been presented to the Board of Public Works for a bridge over Fall Creek at Senate avenue. The matter will be considered the first of next year.

Leavenworth, Tex.—Bids will be received until Oct. 5 for a bridge over the Tonganoxie Creek and one over the South Fork of the Plum Creek on Knapp road. J. W. Wiehaus, County Clerk.

Little Rock, Ark.—The contract for constructing a free bridge at the foot of Main street was awarded Sept. 8 to the Groton Bridge and Manufacturing Company of Groton, N. Y., for $353,000.22.

Milwaukee, Wis.—An ordinance is before the Common Council for permission to build a temporary bridge across the Kinnikinnic River, while a new bridge is being erected by the Northwestern road.

Elk Point, S. D.—Bids are asked until Oct. 15 for constructing a wooden and iron bridge at the mouth of the Broken Kettle and one over the Big Sioux River A. P. Ashjeld, County Auditor.

Green Bay, Wis.—The plans for a 182-ft. draw bridge, which was made by E. L. Shaw, Civil Engineer, have been approved by the common council and have been submitted to the War Department for approval. Bids will be asked shortly for its construction.

Cario, Ill.—Bids will be received until Oct. 6 for the construction of one span of 100 feet or two spans of 75 feet each of steel or wood, or a combination of both, to be erected at and conecting with the north end of the present bridge over Cache river, about 6 miles from Cario. Jas. S. Reardon, City Comptroller.

PARKS.

Manchester, N. H.—About eighty acres of land has been purchased for a park.

Oakland, Cal.—A plan is being urged for obtaining ground for a public park.

Pittsburg, Pa.—Holliday and West End Parks will be improved at once.

South Omaha, Neb.—It is probable that nothing will be done this year toward improving the park.

Pueblo, Col.—This city has voted to issue $75,000 worth of bonds to purchase land for a park.

St. Louis, Mo.—A 100-ft. boulevard west of Forest Park, extending from Skinker road to Clayton, is proposed.

Cleveland, O.—The citizens on Kinsman street are urging the necessity of a park in their section of the city.

New Haven, Conn.—Edgewood Park has been improved at small expenditure, but with results that are thoroughly appreciated by the citizens.

Salem, Mass.—The contract for the construction of the Cox Hill Park at th north end was awarded, Sept. 14, to Perkins & White at $23,000.

New York, N. Y.—The Board of Park Commissioners has purchased a plot of ground east of Grant's tomb, on Riverside drive, which will be graded and converted into a handsome park.

Philadelphia, Pa.—Ordinances have been favorably reported to councils to condemn ground for park purposes in the Seventh ward and in the Seventeenth ward.

Orange, N. J.—The Essex County Park Commission has decided upon a fifth park, to be situated between Millburn and South Orange, in Orange Mountain, and comprising about 2,000 acres.

Kansas City, Mo.—The property-owners on S. Troost avenue have revived the proposition to condemn Troost Park and property adjoining it and add it to the park system, which is now in the course of construction.

Hickville, N. Y.—A large tract of land owned by John J. Pollock and others has been incorporated as Waldorf Park and the object of Mr. Pollock will be to make the park an ideal place for private residences.

Newport, R. I.—The Park Commissioners, appointed to prepare plans for an esplanade and park on Wellington avenue have laid the plans before the commission. The committee recommends that proposition be placed before the people to raise money for such improvement.

Providence, R. I.—The Park Commissioners have reported a resolution to the City Councils providing for the action of the citizens in voting a bond issue for proposed improvements and for the legislature to authorize the condemnation of necessary lands, condemning them as marsh lands and improving them by making a boulevard and park.

Nashville, Tenn.—A plan has been suggested by Prof W. C. Kilvington to arrange for four parks, one for each division of the city—east, west, north and south. Two of these parks should be exclusively for pedestrians and should be as near the city as possible and easy of access. A street car track to encircle both parks is suggested. The large parks should be located in such a way as to secure prominent views, fine drives and be susceptible of diversified improvements at small outlay, constantly keeping in view the general utility.

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Taxpayers and city officials have never made a mistake when insisting that Trinidad Lake Asphalt shall be the cementing material in asphalt pavements enjoyed in their cities. More paving companies and contractors are added each year to those already purchasing this material after abandoning other asphalts.

ITS QUALITY IS UNIFORM; ITS QUANTITY INEXHAUSTIBLE; ITS SUPPLY PROMPT.

There is room for competition between the *paving* companies purchasing Trinidad Lake Asphalt. This is shown by the fact that in a standard pavement of five inches of concrete foundation, one and a half inches binder, and two inches wearing surface, the refined Trinidad Lake Asphaltum is but about 6 per cent. of the materials purchased, leaving about 94 per cent. in volume or weight of the other materials (sand, cement, crushed stone, etc.), to be obtained elsewhere. Moreover, the entire cost of labor for grading the streets, compounding and laying the asphalt pavements, is more than that of all the materials used. It is evident that because the asphaltum forms so small a part of the whole, cities desiring good asphalt pavements are warranted in demanding Trinidad Lake Asphalt and accepting nothing else.

THE TRINIDAD ASPHALT COMPANY,
NO. 66 BROADWAY, NEW YORK,

are importers, exporters and dealers in Trinidad Lake Asphalt for paving and other uses. It sells Trinidad Lake Asphalt at a very moderate profit to itself and without restriction as to its use upon the part of any purchaser. Its sole aim is to create the largest possible demand for its material; and it does not hesitate to sell to any reputable persons who are financially responsible and who satisfy this company that the material so purchased will be used in good faith and in a legitimate way to increase the consumption. This company has never been interested, directly or indirectly, in any paving contract.